

1997 PERFORMANCE REPORT
GENERAL CHEMISTRY AND
MICROBIOLOGY ANALYSES SECTION

MAY 1999



**Ministry
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1997 PERFORMANCE REPORT

GENERAL CHEMISTRY AND MICROBIOLOGY SECTION

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Ontario Ministry of the Environment

April 1999

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INTRODUCTION

The General Chemistry and Microbiology Section (GCMS) is part of the Ministry of the Environment Laboratory Services Branch. The section is comprised of three units, two of these, Water Chemistry and Dorset, identify and provide quantitative analysis for major ions, nutrients, and physical properties in a variety of matrices. The Microbiology Unit identifies and enumerates indicator bacteria of water and waste waters.

This report provides a brief outline of the analytical quality control (QC) program associated with sample analysis and examines 1997 performance data for each test in the Water Chemistry and Dorset Units. GCMS strives to maintain a high standard of analytical performance through its quality assurance program, QC is an integral part of this process.

Table of Contents

1.0 Performance Report Format	1
2.0 Analytical Quality Control Program, Chemistry	4
2.1 Performance Summaries, Chemistry	7
Acidity, Gran (E3248A)	8
Acidity, Total Fixed Endpoint (E3248A)	11
Alkalinity Gran (E3042A)	14
Alkalinity Total Fixed Endpoint (E3042A)	17
Alkalinity Total Fixed Endpoint (E3218A)	20
Alkalinity Total Fixed Endpoint (E3289A)	23
Aluminum, Total (E3300A)	26
Calcium (E3249A)	29
Carbon, Dissolved Inorganic (E3028A)	32
Carbon, Dissolved Inorganic (E3370A)	35
Carbon, Dissolved Organic (E3370A)	38
Chloride (E3004A)	41
Chloride (E3016A)	44
Chloride (E3147A)	47
Chloride (E3148A)	50
Chloride (E3372A)	53
Chlorine, Total Residual (E3309A)	56
Chlorophyll "a" (E3169A)	59
Chlorophyll "a" Acidified (E3169A)	62
Chlorophyll "b" (E3169A)	65
Colour, True (E3025A)	66
Colour, True (E3219A)	69
Conductivity (E3024B)	72
Conductivity (E3177A)	75
Conductivity (E3218A)	78
Conductivity (E3289A)	81
Cyanide, Total (E3015A)	84
Fluoride (E3369A)	88
Iron, Total (E3303B)	91
Magnesium (E3249A)	94
Manganese (E3303B)	97
Nitrate (E3004A)	100
Nitrogen, Ammonia Plus Ammonium (E3364A)	103
Nitrogen, Ammonia Plus Ammonium (E3366A)	106
Nitrogen, Ammonia Plus Ammonium (E3374A)	109
Nitrogen, Nitrate (E3148A)	112
Nitrogen, Nitrate (E3372A)	116
Nitrogen, Nitrate Plus Nitrite (E3364A)	119
Nitrogen, Nitrate Plus Nitrite (E3366A)	122
Nitrogen, Nitrate Plus Nitrite (E3369A)	125

Table of Contents Continued

Nitrogen, Nitrate Plus Nitrite (E3374A)	128
Nitrogen, Nitrite (E3364A)	131
Nitrogen, Nitrite (E3366A)	134
Nitrogen, Total Kjeldahl (E3116A)	137
Nitrogen, Total Kjeldahl (E3118A)	140
Nitrogen, Total Kjeldahl (E3367A)	142
Nitrogen, Total Kjeldahl (E3368A)	145
Oxygen Demand, Biochemical (E3182A)	148
Oxygen Demand, Chemical (E3170A)	152
Oxygen Demand, Chemical (E3246A)	155
pH (E3042A)	158
pH (E3218A)	161
pH (E3248A)	164
pH (E3289A)	167
Phenolics, Reactive (E3179A)	170
Phosphorus, Reactive ortho-Phosphate (E3364A)	173
Phosphorus, Reactive ortho-Phosphate (E3366A)	176
Phosphorus, Total (E3036A)	179
Phosphorus, Total (E3116A)	182
Phosphorus, Total (E3118A)	185
Phosphorus, Total (E3367A)	187
Phosphorus, Total (E3368A)	190
Potassium (E3249A)	193
Silicon, Reactive Silicates (E3370A)	196
Sodium (E3249A)	199
Solids, Dissolved (E3188B)	202
Solids, Suspended (E3188B)	205
Solids, Suspended Ignited (E3188B)	208
Solids, Total (E3188B)	212
Solids, Total Ignited (E3188B)	216
Sulphate (E3004A)	220
Sulphate (E3147A)	223
Sulphate (E3148A)	226
Sulphate (E3172A)	231
Sulphate (E3372A)	234
Turbidity (E3311A)	237
 Bibliography	 240
Abbreviations	241
Appendix A	243

1.0 PERFORMANCE REPORT FORMAT

The parameters are those analysed by the GCMS. The performance summaries listed are those from 1997 data. Where few data results are observed (less than 10) graphs are not presented.

The performance report is organized alphabetically according to test name (eg. Total Organic Carbon is filed under the heading "Carbon, Total Organic") and second, by the method reference number. Detailed information concerning the format of each page is outlined below:

1.1 TEST DESCRIPTION

<u>TITLE:</u>	The name of the test parameter.
<u>IDENTIFICATION:</u>	
Laboratory:	Location where the test is performed.
Method Reference No:	A number assigned by the Quality Management Unit to an analytical test method eg.(E3228A). The letter at the end denotes revision status.
LIMS Product Code:	LIMS code for analysis request.
Sample Type/Matrix:	The various sample types that can be routed to the method.
Method Introduced:	Date that the method was implemented at the laboratory.
Reporting Units:	Unit of measurement in which the results are reported.
Supervisor:	Name of supervisor/manger responsible for the method.

SAMPLING:

The type of container and preservative (if applicable) that is used and minimum volume of sample that is usually required. Any sample preparation that is normally performed in the field, is also indicated (1).

SAMPLE PREPARATION:

Sample preparation techniques which are usually performed at the laboratory before analysis.

ANALYTICAL PROCEDURE:

Brief summary of the analytical method used to determine the parameter.

INSTRUMENTATION:

Type of instrumentation used to perform the test. Automated continuous flow systems consist of a sampler, peristaltic pump, manifold for reagent addition, detection system and readout system. Microcomputers are used to control the operation of analytical equipment and/or data acquisition.

REPORTING:

W and T are low level data qualifiers assigned to data that are near or below the detection limit values (2). The code <W indicates that no measurable response was observed under the test conditions. The value reported indicates the minimum amount of analyte measurable under routine conditions. The code <T is used to represent a measurable amount of the analyte which under the test conditions is not verifiable. The reported result should be used only for large batches of similar data to evaluate background levels or trends of contaminants in the environment where more sensitive analytical methods are not available.

To provide a consistent Laboratory Services Branch approach to data reporting, GCMS calculates W from the standard deviation of duplicates (S_2), near zero, by rounding down to the nearest 1,2 or 5 digit. T is five times W. The latest calculations, valid at date of publication for W and T values of all active methods, are contained in this report (APPENDIX A).

Data is reported to a maximum of three significant figures to the nearest W.

CALIBRATION:

The number of standards used to calibrate the analytical system plus blanks if applicable.

CONTROLS:

The calibration, drift, recovery, and interference controls that are used when applicable to ensure that the system is operating properly.

MODIFICATIONS:

Modifications made to the test in 1997.

NOTES:

Explanatory notes which may aid the data user in interpreting results and information.

1.2 PERFORMANCE DATA SUMMARY

QUALITY CONTROL DATA FROM/TO:

The period of time over which data were collected.

ANALYTICAL RANGE AND REPORTING UNIT:

The full scale value for the analytical range is given in concentration units.

CALIBRATION CONTROL:

Calibration control includes a table outlining the number of data collected over the selected time period; expected concentrations of the control standards; the calculated mean concentration of these standards; mean bias (mean concentration minus the expected concentration); and standard deviations of each control standard. The between run standard deviation (S), the within run standard deviation (S_w), the ratio S/S_w , and the control limits for standards sums and differences are provided.

RECOVERIES (Where applicable):

The table outlines the number of data collected over the selected time period; expected concentrations of the recovery standards; the calculated mean concentration of these standards; and standard deviations of each recovery standard.

DUPLICATES:

The table outlines within run duplicate data collected over the selected time period. Data are sorted into a number of concentration spans. The standard deviation for duplicates is provided for each range. The coefficient of variation (%) is determined by dividing the mean standard deviation (S_2) for a particular concentration span by the mean concentration of duplicate results in that span and multiplying by 100.

OTHER CHECKS (Where applicable):

The table outlines the number of data collected over a selected time period; the calculated mean concentration of ie., blank; and standard deviation.

1.3 QUALITY CONTROL GRAPHICS

CALIBRATION CONTROL:

Calibration control standards sums and differences are plotted on a horizontal scale for the period of data collection (referred to on the graphs as "QUALITY CONTROL STANDARD A+B" for example). The vertical scale consists of the warning/control limits expressed on either side of the expected value. These limits were chosen from analytical performance data.

2.0 ANALYTICAL QUALITY CONTROL PROGRAM

Quality control is a continuous process that involves constant checks of sample processing procedures. This report summarizes the QC data collected during analytical processing to monitor performance of the analytical system.

Calibration is conducted by analysing a series of calibration standards covering the analytical range. Since a high degree of both precision and accuracy is required to detect and minimize any between-run changes, the standards are analysed with as little handling as possible.

Once a system has been calibrated, quality control begins. Depending on the analytical procedure, quality control may be used to evaluate: calibration, blank, recovery, sensitivity, potential interference, and sample repeatability.

Calibration and Blank

Calibration is controlled by a minimum of two quality control standards and a long term blank which are prepared and maintained independently of the calibration standards. The system is not calibrated with the quality control standards. The long term blank is prepared identical to the quality control standards but with zero concentration of the analyte. Control standards are prepared less frequently than calibration standards and errors in newly prepared calibration standards can be detected by this cross check. Newly prepared control standards are run in parallel with in use control standards and must meet control requirements over three consecutive runs before the new standards are accepted on line.

The standard deviation of the control standards is used to estimate the between run standard deviation (S) and is compared against the within run standard deviation (S_w). If the ratio S/S_w exceeds 1.5 then poor control of systematic error can be inferred (3). Values for S and S_w are calculated as follows:

$$2S^2 = (S_A)^2 + (S_B)^2 \qquad 2S_w^2 = (S_{A-B})^2$$

Where

S_A = standard deviation (s.d.) of control standard A

S_B = s.d. of control standard B

S_{A-B} = s.d. of the difference between control standards A and B

NOTE: If a second range is employed for a test, more control standards are used because, in many systems, the between run standard deviations are concentration dependent.

Detailed description of the quality control processes are outlined in several LSB reports (2)(4)(5) and (6).

Control/Warning Limits

The control standards data are assessed and compared against the control/warning limits established from previous data to determine whether the calibration process is in control. The limits are setup initially based on method performance (4), and examined yearly to review if modifications are required based on historical data calculations. Control limits are calculated for the sums and differences of control standards (A,B,C,D) by the equations:

$$(A+B) \pm 4.0 \times S_{A+B} \text{ for the sum of A+B}$$

$$(B+C) \pm 4.0 \times S_{B+C} \text{ for the sum of B+C}$$

$$(C+D) \pm 4.0 \times S_{C+D} \text{ for the sum of C+D}$$

$$(A-B) \pm 3.0 \times S_{A-B} \text{ for the difference of A-B}$$

$$(B-C) \pm 3.0 \times S_{B-C} \text{ for the difference of B-C}$$

$$(C-D) \pm 3.0 \times S_{C-D} \text{ for the difference of C-D}$$

Note: Warning Limits are calculated by the same formulae above (using ± 2.0 instead of 4.0 and 3.0 respectively).

If a control limit is exceeded, the analysis is stopped, corrective action taken and the control standards are re-analysed.

Recovery

Some methods require sample pre-treatment, such as digestion or extraction. A recovery check, suitable to that method, is required to estimate the efficiency of the pre-treatment. Recovery standards are usually prepared at 0%, 20% and 80% of full scale. The solutions are analysed in the same manner as routine samples. Although these solutions are not used to calibrate the instrument, corrections for the blank and matrix effects are calculated and applied if necessary. For an analytical run to be accepted, the recoveries should be within $\pm(5\% + T/2)$ of their expected values. (See Section 1.1 "Reporting" for T determination). The average blank should be within three standard deviations of its historical mean. If a second range is employed for a test, at least one additional recovery standard is used.

Sensitivity and Baseline

Any change in the sensitivity of the instrumentation is monitored periodically by analysing a standard that is usually 80% of full scale, and comparing the reading to the original calibration standards. Baseline drift is usually recorded by periodic analysis of pure deionized water (Pure-DW) which does not contain any of the analyte, but may be adjusted to correspond to sample pre-treatment.

Interference

The interference check is run on any test where a substance may be present in concentrations that affect the results. The check is carried out near the threshold concentration of the interfering substance, beyond which the methodological safeguards used to minimize the interference is no longer effective. The check indicates that the interference has no effect up to the specified concentrations. Spiked samples are not analysed on a routine basis.

Sample Repeatability

Generally, one sample out of twenty is analysed in duplicate up to a maximum of three duplicates per analytical run. The samples are selected for non-adjacent, within-run duplicate analyses. By analysing samples in duplicate, the ability of the analyst to obtain repeatable analytical results, within an analytical run, can be determined. For results to be acceptable, at least two-thirds of the duplicate data must conform to limits that are set based on historical performance.

The observed differences in duplicate results are accumulated and sorted according to analyte concentration span. A standard deviation is calculated for each concentration span. The algorithm differs from the conventional standard deviation as follows:

Conventional Std. Dev. (1)*

$$S_1 = \sqrt{\frac{\sum_{i=1}^n (\bar{x} - x_i)^2}{n-1}}$$

Std. Dev. of Duplicates (2)*

$$S_2 = \sqrt{\frac{\sum_{i=1}^{n'} (x_1 - x_2)_i^2}{2n'}}$$

* Standard deviations used for the data summaries.

Where

S_1 = sample standard deviation

S_2 = duplicate difference standard deviation

n = number of data

\bar{x} = mean of data

x_i = i^{th} result

$(x_1 - x_2)_i$ = difference of the i^{th} duplicate

n' = number of duplicate pairs

Reported values for duplicate standard deviations have been treated by robust statistical methods (7)(8). The standard deviation (S_2) of the duplicate difference is also expressed as the coefficient of variation (CV) using the untreated standard deviation.

$$CV = \frac{S_2}{\bar{X}} \times 100$$

2.1 PERFORMANCE SUMMARIES

ACIDITY, GRAN

IDENTIFICATION:

Laboratory	Water Chemistry	Method Introduced	01/08/82
Method Reference No	E3248A	Reporting Units	µg/L as H ⁺
LIMS Product Code	PHACD3248	Supervisor	J. McBride
Sample Type/Matrix	Effluent, Industrial Waste, Raw Sewage, Drinking Water, Leachate, Precipitation, Surface Water		

SAMPLING:

Quantity Required	50 mL
Container	Glass or Plastic

ANALYTICAL PROCEDURE:

Sample aliquots (50.0 mL) are titrated with 0.01 N sodium hydroxide to pH >8.3. The titrant is standardized against 0.0005 N potassium hydrogen phthalate. The titrant delivery rate is determined from the slope of the titration curve and the stability of the pH readings following each aliquot of titrant. Data are subjected to Gran analysis. pH and total fixed endpoint acidity are determined simultaneously.

INSTRUMENTATION:

Automated modular titration system with microcomputer control and data processing software.

REPORTING:

Maximum Significant Figures: 3	Current W value: 1	Current T value: 5
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CALIBRATION:

2 standard buffers covering the pH range of 4 to 9

CONTROLS:

Calibration	Long Term Blank plus 2 standards, e.g. QCA
-------------	--

NOTES:

A new automated system was introduced in Sept' 96.

ACIDITY, GRAN (E3248A)

QUALITY CONTROL DATA FROM 21/01/97 TO 30/10/98

Analytical Range: to 1000 µg/L as H⁺

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	34	500.0	506.6	6.6	9.5225
B:	34	200.0	199.8	-0.2	5.2018
A+B:	34	700.0	706.4	6.4	12.505
A-B:	34	300.0	306.7	6.7	8.894

s.d.(AB) S(between runs): 7.67

Sw(within run): 6.29

S/Sw: 1.2

On any given day the calibration is accepted if the calibration control values obtained lie within the ranges:

662 - 738 for A+B
272 - 328 for A-B

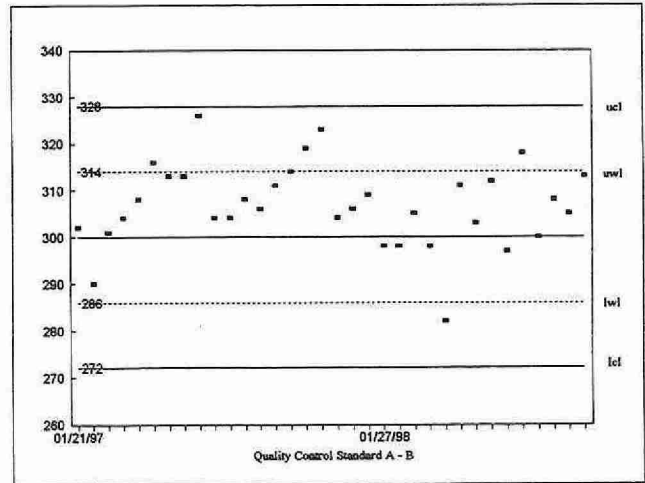
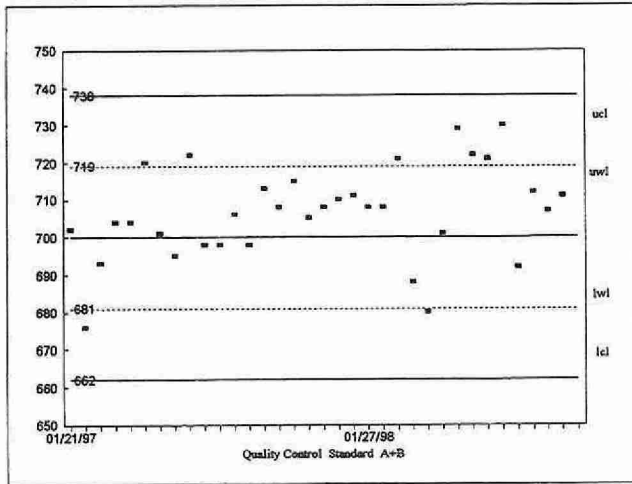
DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
72	0 - 100	1.8148	10.2
10	101 - 250	2.9082	2.8
1	250 - 500	N.A.	N.A.
83	Overall	2.1320	

OTHER CHECKS:

	n	Mean	Standard Deviation (1)
Long Term Blank	22	-1.0	3.3591

Acidity, Gran (ug/L as H +)
 Quality Control Data from 21/01/97 to 30/10/98
 E3248A



ACIDITY, TOTAL FIXED ENDPOINT

IDENTIFICATION:

Laboratory	Water Chemistry	Method Introduced	01/08/82
Method Reference No.	E3248A	Reporting Units	mg/L as CaCO ₃
LIMS Product Code	PHACD3248	Supervisor	J. McBride
Sample Type/Matrix	Effluent, Industrial Waste, Raw Sewage, Drinking Water, Leachate, Precipitation, Surface Water		

SAMPLING:

Quantity Required	50 mL
Container	Glass or Plastic

ANALYTICAL PROCEDURE:

Sample aliquots (50.0 mL) are titrated with 0.01 N sodium hydroxide to pH >8.3. The titrant is standardized against 0.0005 N potassium hydrogen phthalate. The titrant delivery rate is determined from the slope of the titration curve and the stability of the pH readings following each aliquot of titrant.

pH and gran acidity are determined simultaneously.

INSTRUMENTATION:

Automated modular titration system with microcomputer control and data processing software.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.05	Current T value: 0.25
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CALIBRATION:

2 standard buffers covering the pH range of 4 to 9

CONTROLS:

Calibration	LTBL plus 2 standards, e.g. QCA
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NOTES:

A new automated system was introduced in Sept' 96.

ACIDITY, TOTAL FIXED ENDPOINT (E3248A)

QUALITY CONTROL DATA FROM 21/01/97 TO 30/10/98

Analytical Range: to 100 mg/L as CaCO₃

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	34	25.0	25.38	0.38	0.5144
B:	34	10.0	10.00	0.00	0.2877
A+B:	34	35.0	35.38	0.38	0.6884
A-B:	34	15.0	15.38	0.38	0.4700

s.d.(AB)

S(between runs): 0.42

Sw(within run): 0.33

S/Sw: 1.3

On any given day the calibration is accepted if the calibration control values obtained lie within the ranges:

32.8 - 37.2 for A+B
13.4 - 16.6 for A-B

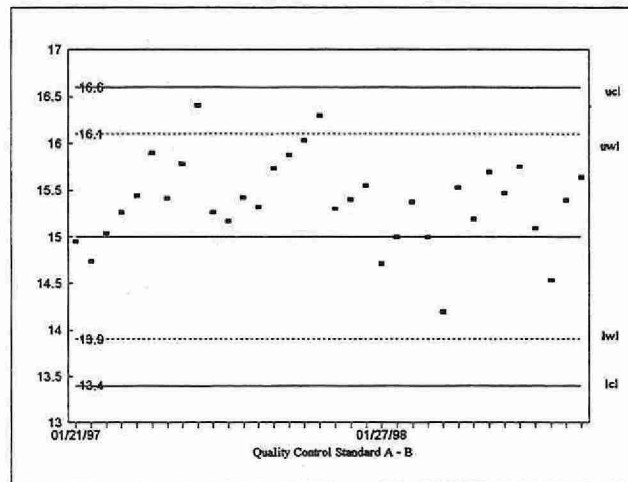
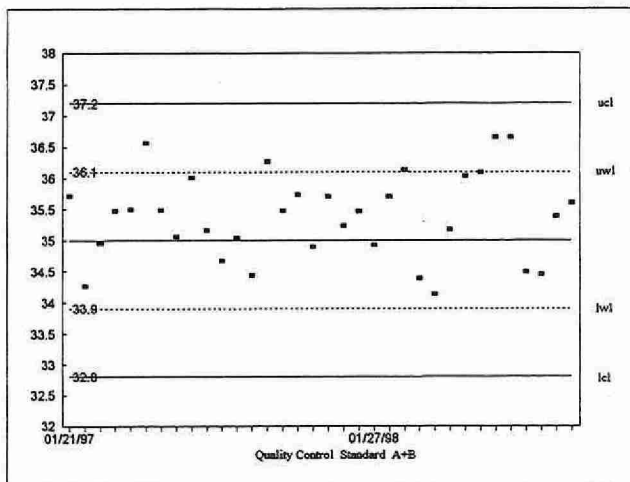
DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
57	0.0 - 4.0	0.0485	3.6
25	4.1 - 10.0	0.1527	5.7
1	10.1 - 20.0	N.A.	N.A.
83	Overall	0.0730	

OTHER CHECKS:

	n	Mean	Standard Deviation (1)
Long Term Blank	34	0.0306	0.1907

Acidity, Total Fixed Endpoint (mg/L as CaCO₃)
 Quality Control Data from 21/01/97 to 30/10/98
 E3248A



ALKALINITY, GRAN

IDENTIFICATION:

Laboratory	Dorset	Method Introduced	26/07/79
Method Reference No.	E3042A	Reporting Units	mg/L as CaCO ₃
LIMS Product Code	PHALK3042	Supervisor	J. McBride
Sample Type/Matrix:	Leachate, Precipitation, Surface Water		

SAMPLING:

Quantity Required:	150 mL
Container:	250 mL Amber polyethylene bottle filled to the brim; screw caps with cone-shaped liners are preferred.

ANALYTICAL PROCEDURE:

Samples (100 mL) are weighed (volume = weight), and titrated with 0.02 N sulphuric acid to a pH <3.7. The titrant delivery rate is determined from the slope of the titration curve and the stability of the pH reading following each aliquot of titrant. Data are subjected to Gran analysis.

N.B. pH is determined simultaneously.

INSTRUMENTATION:

Semi-automated modular titration system with microcomputer control and data reduction software.

REPORTING:

Maximum Significant Figures: 3

CALIBRATION:

2 standard buffers covering the pH range of 4 to 7

CONTROLS:

Calibration	LTBL plus 4 standards, e.g. QCA
Drift	2 standard buffers - 2 times daily

ALKALINITY, GRAN (E3042A)

QUALITY CONTROL DATA FROM 10/01/97 TO 22/12/97

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	80	20.0	19.6	-0.4	0.2365
B:	80	5.0	4.9	-0.1	0.1530
C:	80	-5.0	-4.9	0.1	0.2053
D:	80	-1.25	-1.19	0.06	0.1457
A+B:	80	25.0	24.4	-0.6	0.3240
A-B:	80	15.0	14.7	-0.3	0.2426
C+D:	80	-6.25	-6.13	0.12	0.3383
C-D:	80	-3.75	-3.751	-0.001	0.1108

s.d.(AB) S(between runs): 0.20 Sw(within run): 0.17 S/Sw: 1.2
s.d.(CD) S(between runs): 0.18 Sw(within run): 0.08 S/Sw: 2.2

The calibration is accepted if the calibration control values obtained lie within the ranges:

24.0 - 26.0 for A+B
14.0 - 16.0 for A-B
-8.89 - -3.61 for C+D
-5.73 - -1.77 for C-D

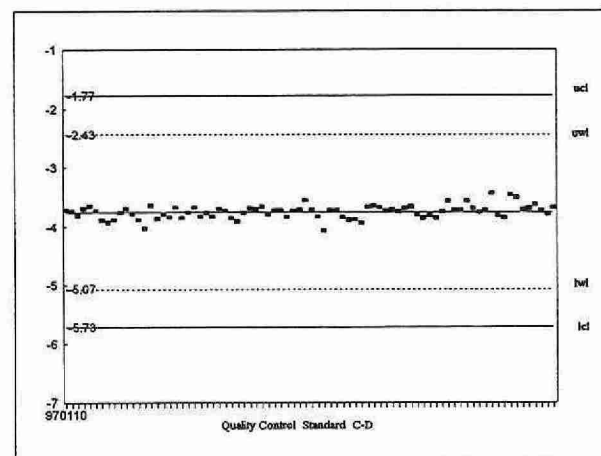
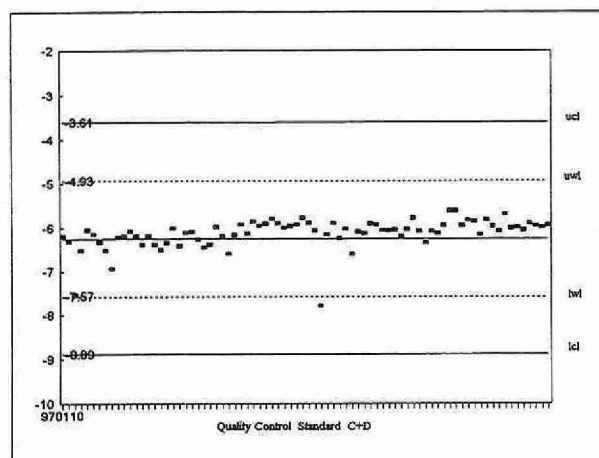
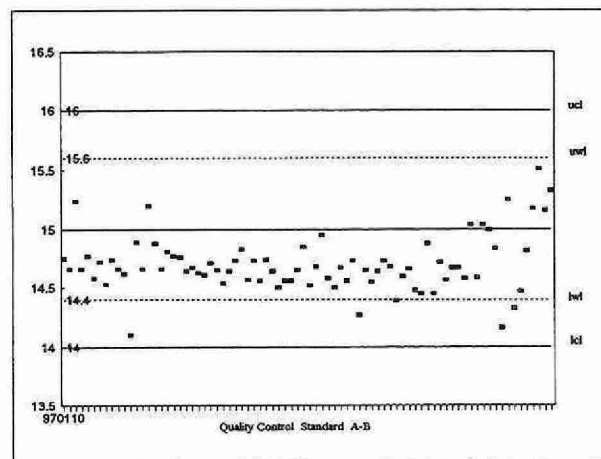
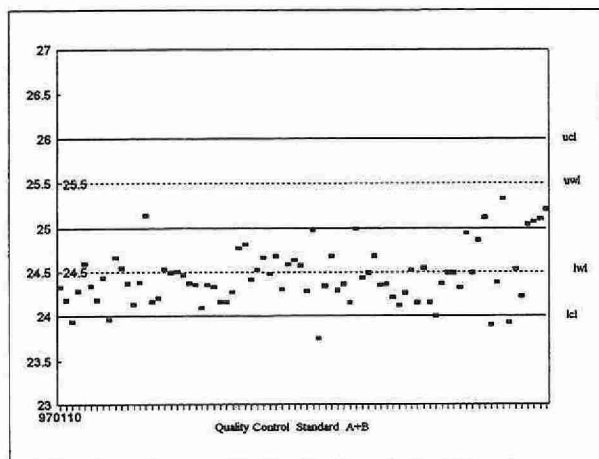
DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
222	-5.0 - 30.0	0.0910	9.1
1	30.1 - 60.0	N.A.	N.A.
1	60.1 - 150.0	N.A.	N.A.
11	151 - 300	0.9196	0.9
235	Overall	0.0986	

OTHER CHECKS:

	n	Mean	Standard Deviation (1)
Long Term Blank	80	0.0252	0.1176

Alkalinity Gran (mg/L as CaCO₃)
 Quality Control Data from 10/01/97 To 22/12/97
 E3042A



ALKALINITY, TOTAL FIXED ENDPOINT

IDENTIFICATION:

Laboratory	Dorset	Method Introduced	26/07/79
Method Reference No.	E3042A	Reporting Units	mg/L as CaCO ₃
LIMS Product Code	PHALK3042	Supervisor	J. McBride
Sample Type/Matrix:	Leachate, Precipitation, Surface Water		

SAMPLING:

Quantity Required:	150 mL
Container:	250 mL Amber polyethylene bottle filled to the brim; screw caps with cone-shaped liners are preferred.

ANALYTICAL PROCEDURE:

Samples (100 mL) are weighed (volume = weight), and titrated with 0.02 N sulphuric acid to a pH 4.5. The titrant delivery rate is determined from the slope of the titration curve and the stability of the pH reading following each aliquot of titrant.

INSTRUMENTATION:

Semi-automated modular titration system with microcomputer control and data processing software.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.05	Current T value: 0.25
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CALIBRATION:

2 standard buffers covering the pH range of 4 to 7

CONTROLS:

Calibration	LTBL plus 2 standards, e.g. QCA
Drift	2 standard buffers - once daily

ALKALINITY, TOTAL FIXED ENDPOINT (E3042A)

QUALITY CONTROL DATA FROM 10/01/97 TO 22/12/97

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	80	20.0	21.3	1.3	0.2603
B:	80	5.00	6.6	1.6	0.2104
A+B:	80	25.0	27.6	2.6	0.9430
A-B:	80	15.0	14.7	-0.3	0.2389

s.d.(AB) S(between runs): 0.24

Sw:(within run): 0.17

S/Sw: 1.4

On any given day the calibration is accepted if the values obtained lie within the ranges:

24.0 - 26.0 for A+B
14.0 - 16.0 for A-B

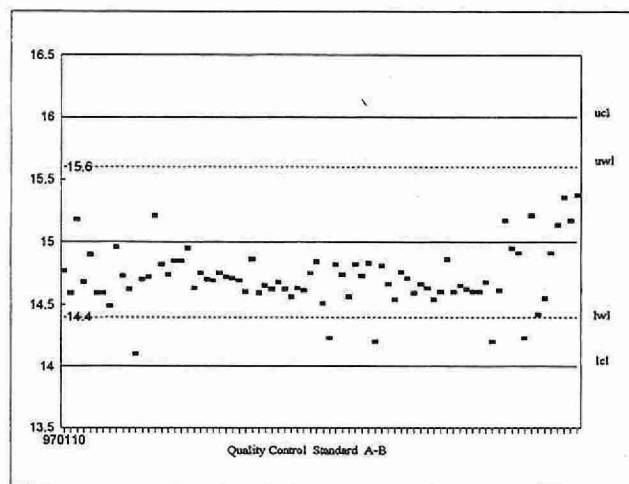
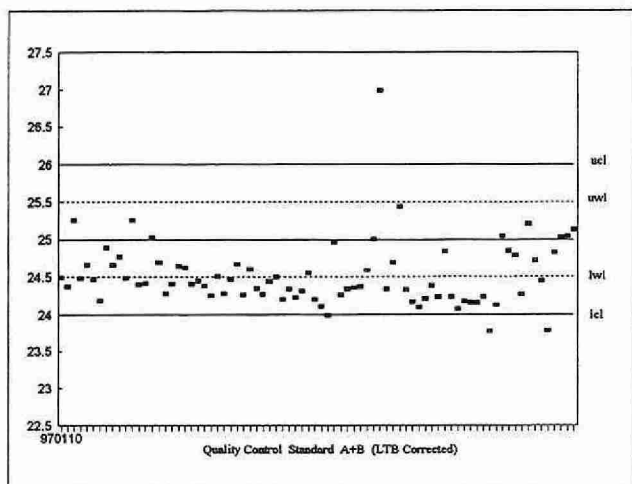
DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
195	0.0 - 30.0	0.0535	5.9
1	30.1 - 60.0	N.A.	N.A.
1	60.1 - 150	N.A.	N.A.
11	151 - 300	0.0369	0.6
208	Overall	0.0524	

OTHER CHECKS:

	n	Mean	Standard Deviation (1)
Long Term Blank	80	1.6716	0.2454

Alkalinity , Total Fixed Endpoint (mg/L as CaCO₃)
Quality Control Data From 10/01/97 To 22/12/97
E3042A



ALKALINITY, TOTAL FIXED ENDPOINT

IDENTIFICATION:

Laboratory	Water Chemistry	Method Introduced	09/07/80
Method Reference No.	E3218A	Reporting Unit	mg/L as CaCO ₃
LIMS Product Code	PHALK3218	Supervisor	J. McBride
Sample Type/Matrix	Raw Sewage, Drinking Water, Effluent		

SAMPLING:

Quantity Required	50 mL
Container	Glass or Plastic

ANALYTICAL PROCEDURE:

Samples (10.0 mL) are titrated with 0.02 N sulphuric acid to pH endpoint of 4.5. The titrant delivery rate is determined from the slope of the titration curve and the stability of the pH reading following each aliquot of titrant.

pH, and conductivity are determined simultaneously.

INSTRUMENTATION:

Automated modular titration system with microcomputer control and data processing software.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.5	Current T value: 2.5
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CALIBRATION:

2 standard buffers covering the pH range of 4 to 9

CONTROLS:

Calibration	BL plus 4 standards, e.g. QCA
Drift	In run standards throughout the run (tap water diluted to 50% V/V)

ALKALINITY, TOTAL FIXED ENDPOINT (E3218A)

QUALITY CONTROL DATA FROM 09/01/97 TO 22/12/97

Analytical Range: to 1000 mg/L as CaCO₃

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	47	250	249.87	-0.13	2.1111
B:	47	100	100.24	0.24	0.9976
C:	47	100	99.21	-0.79	1.2889
D:	47	25	24.63	-0.37	0.5484
A+B:	47	350	350.11	0.11	2.6468
A-B:	47	150	149.62	-0.38	1.9745
C+D:	47	125	123.84	-1.16	1.5957
C-D:	47	75	74.57	-0.42	1.1738

s.d.(AB) S(between runs): 1.65 Sw(within run): 1.40 S/Sw: 1.2

s.d.(CD) S(between runs): 0.99 Sw(within run): 0.83 S/Sw: 1.2

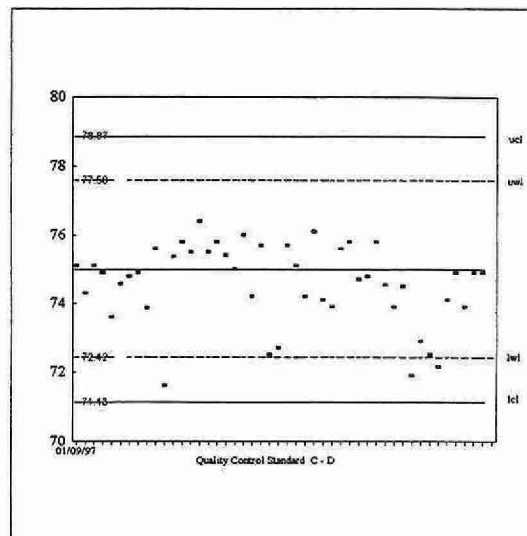
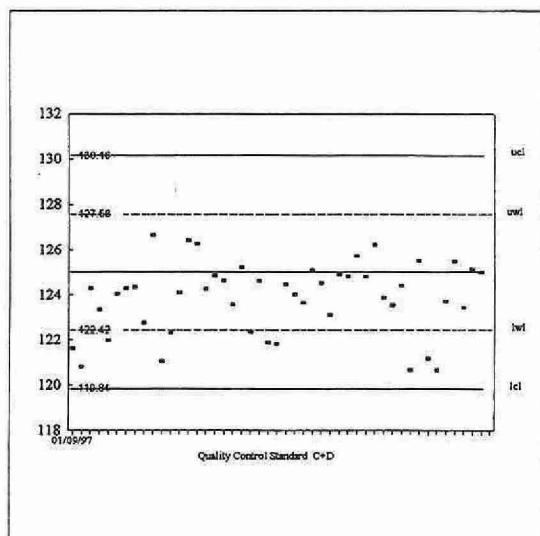
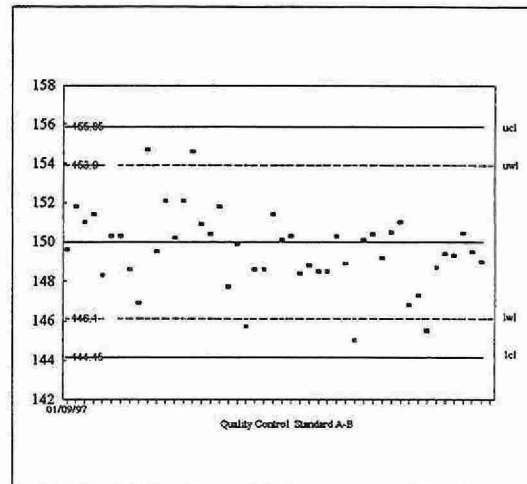
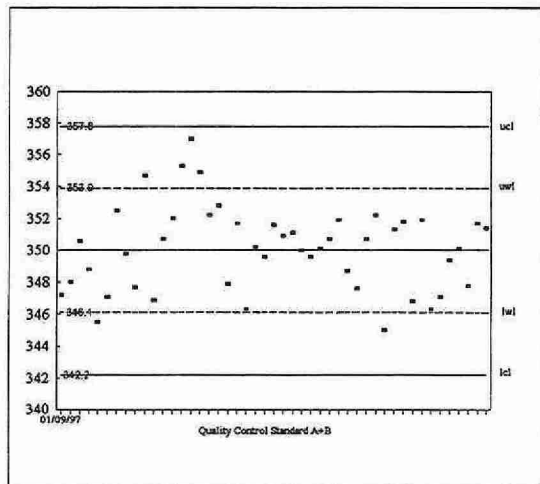
On any given day the calibration is accepted if the calibration control values obtained lie within the ranges:

342.20	-	357.80	for	A+B
144.15	-	155.85	for	A-B
119.84	-	130.16	for	C+D
71.13	-	78.87	for	C-D

DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
48	0 - 100	0.6649	1.1
19	101 - 200	0.8745	0.5
33	201 - 500	0.9648	0.4
2	501 - 1000	2.3591	0.3
102	Overall	0.8482	

Alkalinity , Total Fixed Endpoint (mg/L as CaCO₃)
Quality Control Data from 09/01/97 to 22/12/97
E3218A



ALKALINITY, TOTAL FIXED ENDPOINT

IDENTIFICATION:

Laboratory	Water Chemistry	Method Introduced	09/07/80
Method Reference No.	E3289A	Reporting Unit	mg/L as CaCO ₃
LIMS Product Code	PHALK3289	Supervisor	J. McBride
Sample Type/Matrix	Precipitation, Surface Water		

SAMPLING:

Quantity Required	50 mL
Container	Glass or Plastic

ANALYTICAL PROCEDURE:

Samples (10.0 mL) are titrated with 0.02 N sulphuric acid to pH <4.5. The titrant delivery rate is determined from the slope of the titration curve and the stability of the pH reading following each aliquot of titrant.

pH and conductivity are determined simultaneously.

INSTRUMENTATION:

Automated modular titration system with microcomputer control and data processing software.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.2	Current T value: 1
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CALIBRATION:

2 standard buffers covering the pH range of 4 to 9

CONTROLS:

Calibration	BL plus 4 standards, e.g. QCA
Drift	In run standards throughout the run (tap water diluted to 20% V/V)

ALKALINITY, TOTAL FIXED ENDPOINT (E3289A)

QUALITY CONTROL DATA FROM 08/01/97 TO 15/12/97

Analytical Range: to 1000 mg/L as CaCO₃

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	40	250.0	250.98	0.98	1.3017
B:	40	50.0	50.33	0.33	0.3647
C:	40	10.0	9.69	-0.31	0.1890
D:	40	2.5	2.47	-0.03	0.1389
A+B:	40	300.0	301.31	1.31	1.5340
A-B:	40	200.0	200.65	0.65	1.1408
C+D:	40	12.5	12.16	-0.34	0.2535
C-D:	40	7.5	7.22	-0.28	0.2141

s.d.(AB) S(between runs): 0.96 Sw(within run): 0.81 S/Sw: 1.2

s.d.(BC) S(between runs): 0.166 Sw(within run): 0.151 S/Sw: 1.1

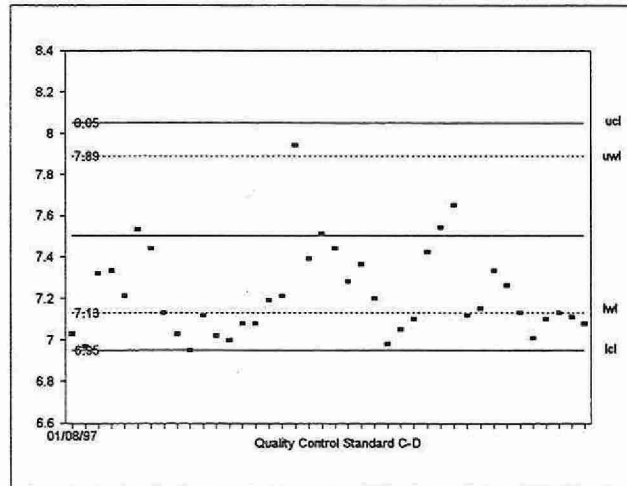
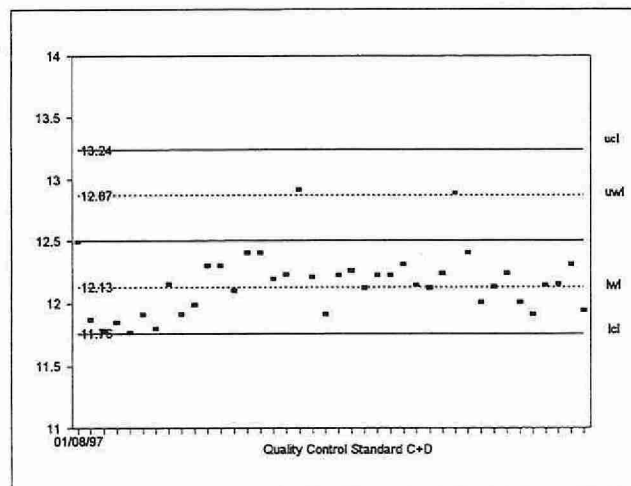
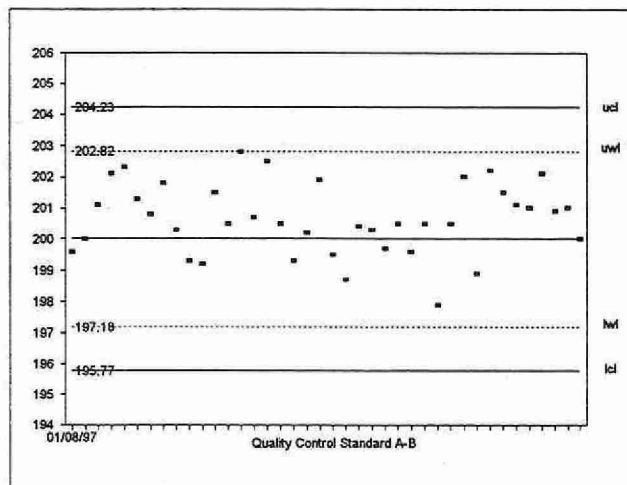
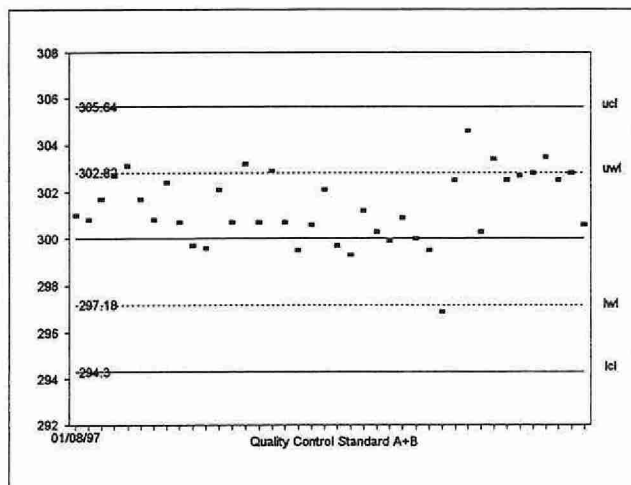
On any given day the calibration is accepted if the calibration control values obtained lie within the ranges:

294.36	-	305.64	for	A+B
195.77	-	204.23	for	A-B
11.76	-	13.24	for	C+D
6.95	-	8.05	for	C-D

DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
16	0 - 50	0.2671	1.1
24	51 - 100	0.6691	0.7
57	101 - 300	1.4719	0.7
2	301 - 1000	N.A.	N.A.
99	Overall	1.1735	

Alkalinity , Total Fixed Endpoint (mg/L as CaCO₃)
Quality Control Data from 08/01/97 to 15/12/97
E3289A



ALUMINUM, TOTAL**IDENTIFICATION:**

Laboratory	Dorset	Method Introduced	06/09/83
Method Reference No.	E3300A	Reporting Units	µg/L as Al
LIMS Product Code	AL3300	Supervisor	J. McBride
Sample Type/Matrix	Leachate, Precipitation, Surface Water		

SAMPLING:

Quantity Required	10 mL
Container	100 mL Polypropylene bottle capped, acidified to 0.1% with HNO ₃

ANALYTICAL PROCEDURE:

This procedure is based on the formation of an aluminum-catechol violet complex at pH 6.2. Acidified samples are oxidized by UV digestion for total aluminum. Phenanthroline-hydroxylamine-HCL reagents are used to reduce interference by iron. Concentrations of aluminum are determined by comparison with a similarly prepared series of standards.

INSTRUMENTATION:

UV-digester

An autoanalyzer with microprocessor for DCI system.

REPORTING:

Maximum Significant Figures: 3	Current W value: 2	Current T value: 10
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CALIBRATION:

BL plus 8 standards daily

CONTROLS:

Calibration	LTBL plus 3 standards, e.g. QCA
Drift	BL every 10 samples and BL plus check standard every 20 samples

ALUMINUM, TOTAL (E3300A)

QUALITY CONTROL DATA FROM 05/02/97 TO 18/12/97

Full Scale: to 1000 µg/L as Al

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	27	600	599.4	-0.6	5.0934
B:	27	200	200.9	0.9	1.7614
C:	27	60	58.7	-1.3	2.5053
A+B:	27	800	800.3	0.3	6.2623
A-B:	27	400	398.5	-1.5	4.3445
B+C:	27	260	259.6	-0.4	3.5534
B-C:	27	140	141.1	1.1	2.4761

s.d.(AB) S(between runs): 3.81 Sw(within run): 3.07 S/Sw: 1.2
s.d.(BC) S(between runs): 2.16 Sw(within run): 1.75 S/Sw: 1.2

The calibration is accepted if the calibration control values obtained lie within the ranges:

780 - 820 for A+B
385 - 415 for A-B
250 - 270 for B+C
134 - 146 for B-C

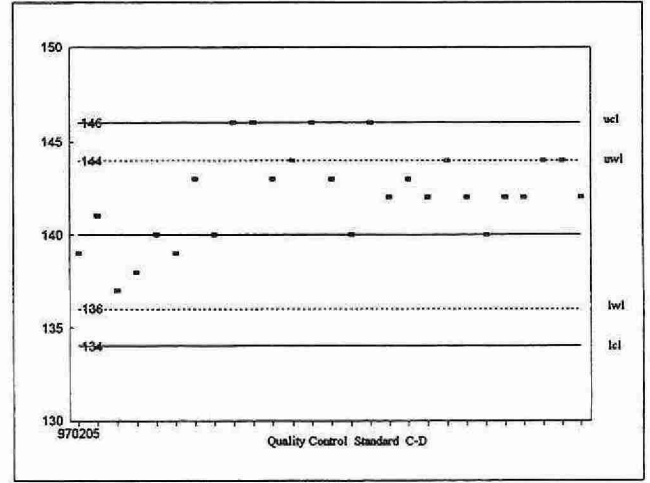
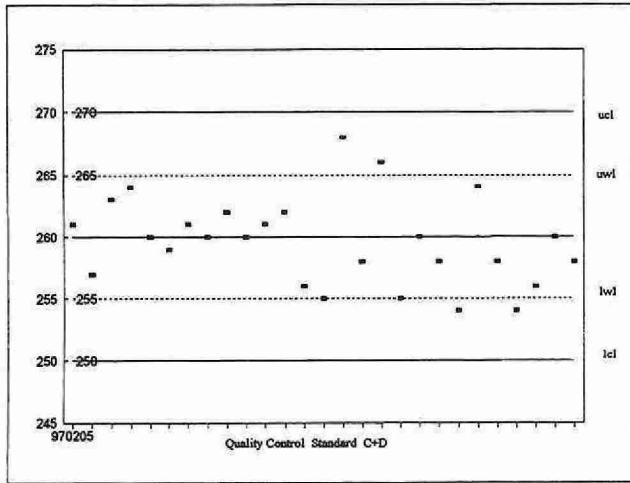
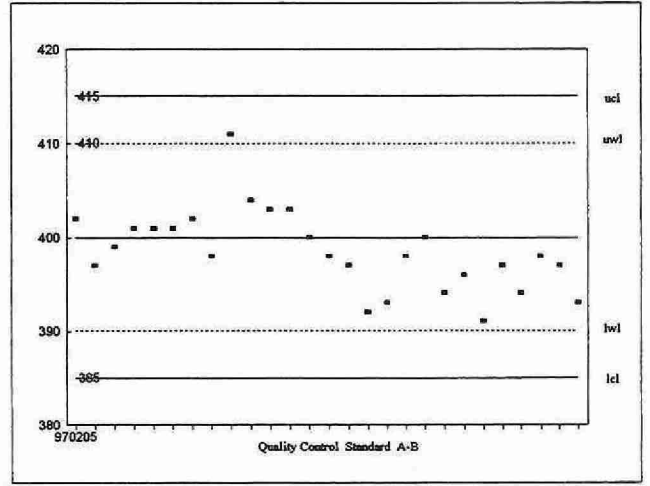
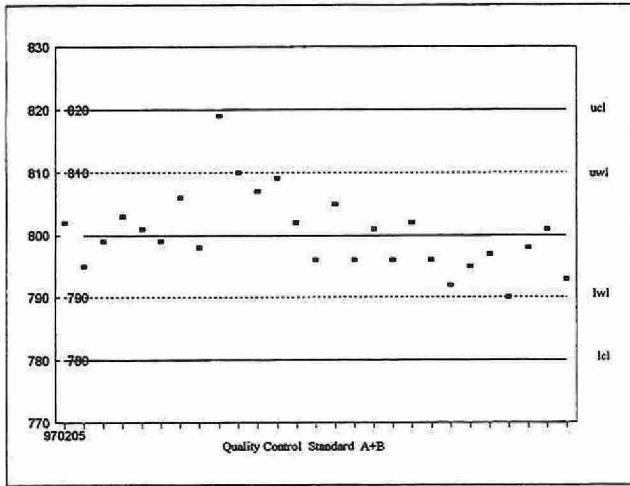
DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
36	0.0 - 100	1.7078	5.5
30	101 - 200	2.1055	1.6
12	201 - 500	2.2453	0.7
53	501 - 1000	3.0000	0.6
81	Overall	2.0040	

OTHER CHECKS:

	n	Mean	Standard Deviation (1)
Long Term Blank	27	0.4444	0.7511

Aluminum , Total (ug/L as Al)
Quality Control Data from 05/02/97 to 18/12/97
E3300A



CALCIUM

IDENTIFICATION:

Laboratory	Dorset	Method Introduced	20/07/88
Method Reference No.	E3249A	Reporting Unit	mg/L as Ca
LIMS Product Code	CAT3249	Supervisor	F. Tomassini
Sample Type/Matrix	Leachate, Precipitation, Surface Water		

SAMPLING:

Quantity Required	5 mL
Container	Plastic

ANALYTICAL PROCEDURE:

Samples are analyzed by AAS at 422.7 nm with an air-acetylene flame. Lanthanum chloride is added as a releasing agent via an automated sampling train.

Approximate absorbance: 0.2 at the full scale level.

INSTRUMENTATION:

Automated modular atomic absorption spectrophotometer (AAS) system.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.02	Current T value: 0.1
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CALIBRATION:

BL plus 5 standards

CONTROLS:

Calibration	LTBL plus 3 standards, e.g., QCA
Drift	BL, reslope standard every 10 samples.

NOTES:

The control standards are corrected for the LTB from which they were made.

CALCIUM (E3249A)

QUALITY CONTROL DATA FROM 14/01/97 TO 23/12/97

Full Scale: to 8.0 mg/L as Ca

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	42	6.4	6.406	0.006	0.0492
B:	42	1.6	1.594	-0.006	0.0208
C:	42	0.4	0.408	0.008	0.0120
A+B:	42	8.0	7.999	-0.001	0.0567
A-B:	42	4.8	4.812	0.012	0.0430
B+C:	42	2.0	1.997	-0.003	0.0280
B-C:	42	1.2	1.186	-0.014	0.0158

s.d.(AB) S(between runs): 0.036

Sw(within run): 0.030

S/Sw: 1.17

s.d.(BC) S(between runs): 0.017

Sw(within run): 0.011

S/Sw: 1.44

The calibration is accepted if the calibration control values obtained lie within the ranges:

7.85	-	8.15	for	A+B
4.69	-	4.91	for	A-B
1.95	-	2.05	for	B+C
1.16	-	1.24	for	B-C

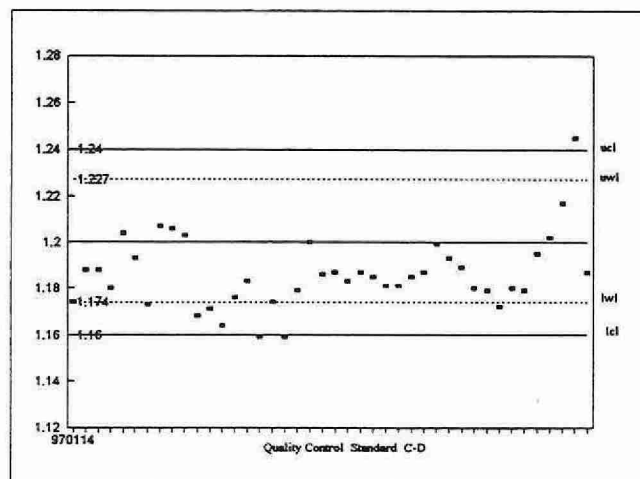
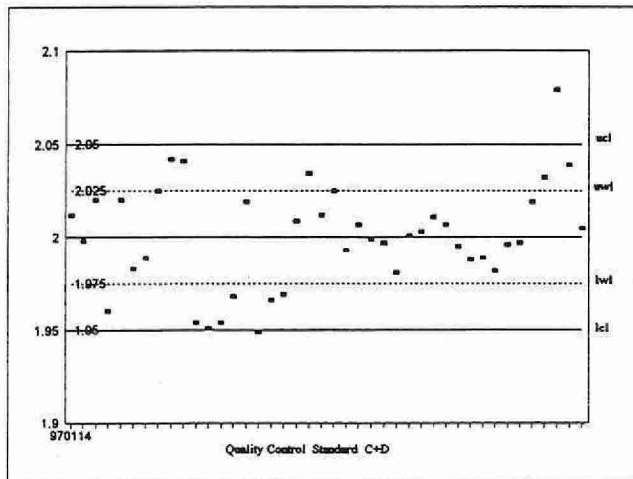
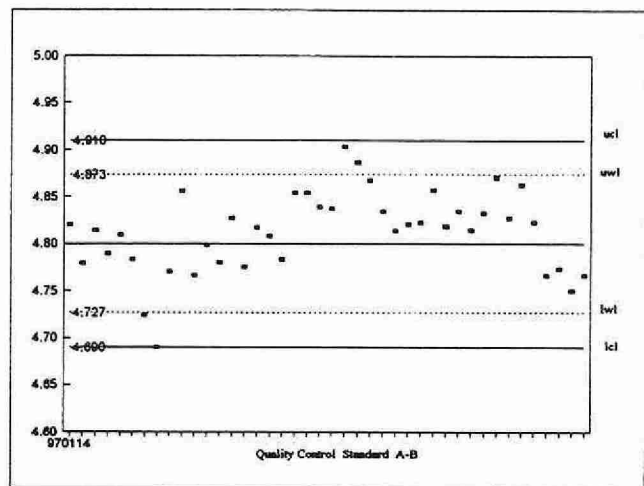
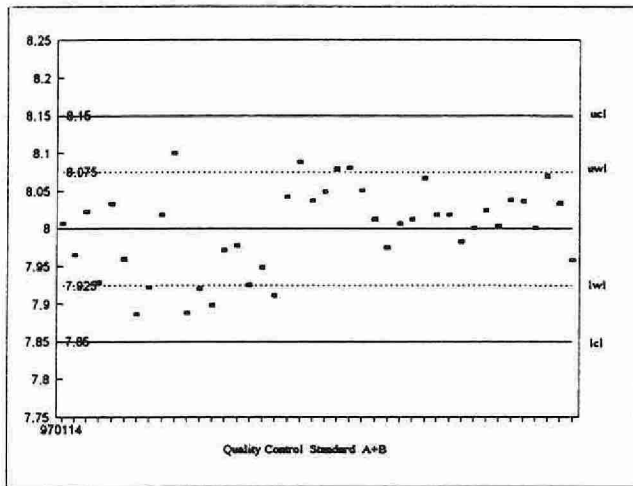
DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
32	0.00 - 0.80	0.0077	2.9
31	0.81 - 1.60	0.0140	1.0
76	1.61 - 4.00	0.0181	0.8
11	4.01 - 8.00	0.0334	0.9
150	Overall	0.0155	

OTHER CHECKS:

	n	Mean	Standard Deviation (1)
Long Term Blank	42	0.0006	0.0119

Calcium (mg/L as Ca)
Quality Control Data From 14/01/97 To 23/12/97
E3249A



CARBON, DISSOLVED INORGANIC

IDENTIFICATION:

Laboratory	Dorset	Method Introduced	03/06/80
Method Reference No.	E3028A	Reporting Unit	mg/L as C
LIMS Product Code	CARB3028	Supervisor	F. Tomassini
Sample Type/Matrix	Leachate, Surface Water		

SAMPLING:

Quantity Required	50 mL
Container	Glass

ANALYTICAL PROCEDURE:

Dissolved inorganic carbon, which is determined colourimetrically on the supernatant of a settled sample, is converted to carbon dioxide gas by acidification. The gas then passes through a gas-permeable membrane into a weakly-buffered alkaline phenolphthalein solution. The decrease in absorbance of this coloured solution is a measure of the dissolved inorganic carbon content of the sample.

Approximate absorbance: 0.3 at the full scale level.

INSTRUMENTATION:

Basic automated modular continuous flow system plus the following modules: air (CO₂-free) supply, dialysis unit. Colourimetric measurement is through a 5.0 cm. light path at 550 nm. Two analytical ranges are obtained from the output of the colourimeter.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.02	Current T value: 0.1
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CALIBRATION:

BL plus 9 standards daily

CONTROLS:

Calibration	LTB plus 3 standards, e.g. QCA, QCB, QCC
Drift	BL every 10 samples; BL plus 1 check standard every 20 samples

CARBON, DISSOLVED INORGANIC (E3028A)

QUALITY CONTROL DATA FROM 10/01/97 TO 19/12/97

Full Scale: to 10.0 mg/L as C

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	47	8.0	7.95	-0.05	0.0967
B:	47	4.0	3.97	-0.03	0.0947
C:	47	0.8	0.76	-0.04	0.0696
A+B:	47	12.0	11.93	-0.07	0.1591
A-B:	47	4.0	3.98	-0.02	0.1064
B+C:	47	4.8	4.74	-0.06	0.1516
B-C:	47	3.2	3.21	0.01	0.0680

s.d.(AB) S(between runs):0.096

Sw(within run): 0.075

S/Sw: 1.27

s.d.(BC) S(between runs):0.083

Sw(within run): 0.048

S/Sw: 1.72

The calibration is accepted if the calibration control values obtained lie within the ranges:

11.4	-	12.6	for	A+B
3.6	-	4.4	for	A-B
4.4	-	5.2	for	B+C
2.9	-	3.5	for	B-C

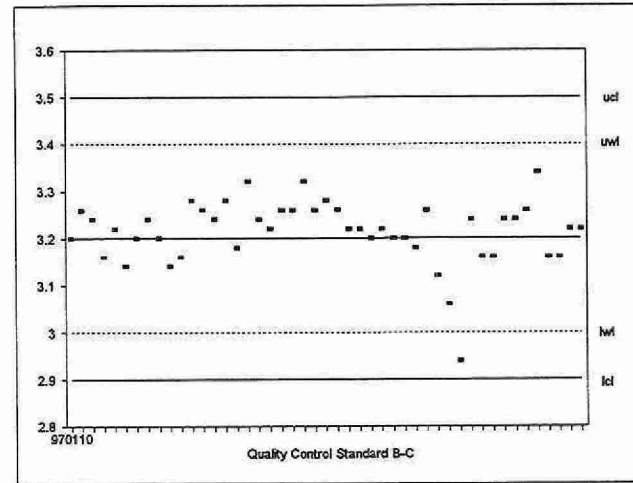
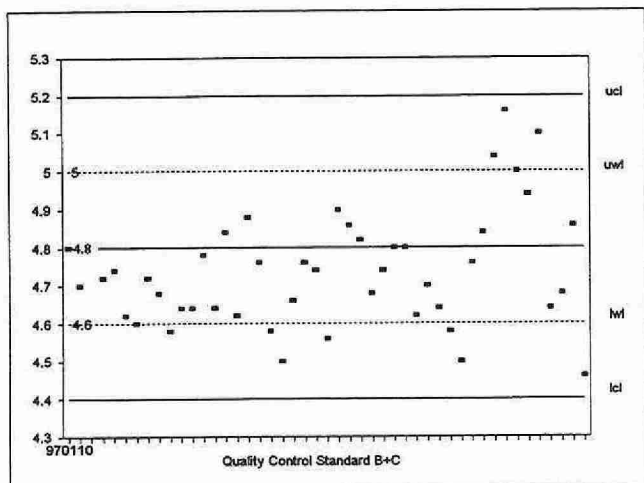
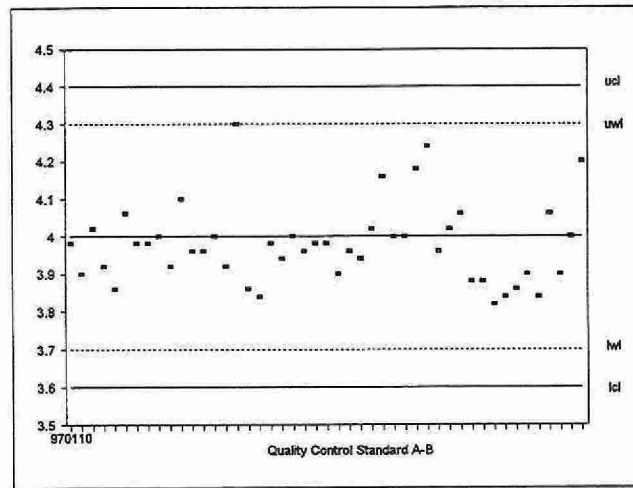
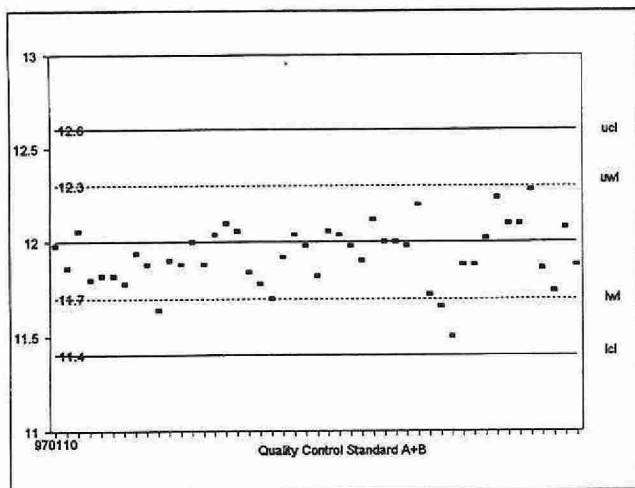
DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
29	0.00 - 1.00	0.0191	2.8
59	1.01 - 2.00	0.0300	9.1
40	2.01 - 5.00	0.0753	4.8
12	5.01 - 10.0	0.0836	5.3
140	Overall	0.0411	

OTHER CHECKS:

	n	Mean	Standard Deviation (1)
Long Term Blank	47	0.208	0.0723

Carbon, Dissolved Inorganic (mg/L as C)
Quality Control Standard Data From 10/01/97 To 19/12/97
E3028A



CARBON, DISSOLVED INORGANIC

IDENTIFICATION:

Laboratory	Water Chemistry	Method Introduced	01/04/78
Method Reference No.	E3370A	Reporting Unit	mg/L as C
LIMS Product Code	DCSI3370	Supervisor	J. McBride
Sample Type/Matrix	Effluent, Industrial Waste, Process Water, Raw Sewage, Drinking Water Ground Water, Leachates, Precipitation, Surface Water		

SAMPLING:

Quantity Required	10 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

Dissolved inorganic carbon, which is determined colourimetrically on the supernatant of a settled sample, is converted to carbon dioxide gas by acidification. The gas then passes through a gas-permeable membrane into a weakly-buffered alkaline phenolphthalein solution. The decrease in absorbance of this coloured solution is a measure of the dissolved inorganic carbon content of the sample.

Approximate absorbance: 0.3 at the full scale level.

Dissolved organic carbon, and reactive silicates are determined simultaneously.

INSTRUMENTATION:

Basic automated modular continuous flow system plus the following modules: air (CO₂-free) supply, dialysis unit. Colourimetric measurement is through a 5.0 cm. light path at 550 nm. Data capture, reduction, and processing via a multi-stage microcomputer system.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.2	Current T value: 1.0
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CALIBRATION:

BL plus 7 standards

CONTROLS:

Calibration	LTBL plus 3 standards, e.g., QCA
Drift	BL every 10 samples; standard every 20 samples.

CARBON, DISSOLVED INORGANIC (E3370A)

QUALITY CONTROL DATA FROM 08/01/97 TO 23/12/97

Full Scale: to 80.0 mg/L as C

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	58	64.0	63.74	-0.26	0.5445
B:	58	16.0	15.91	-0.09	0.2979
C:	58	4.00	4.05	0.05	0.2494
A+B:	58	80.0	79.64	-0.35	0.6733
A-B:	58	48.0	47.83	-0.17	0.5630
B+C:	58	20.0	19.95	-0.04	0.4710
B-C:	58	12.0	11.86	-0.14	0.2829

s.d.(AB) S(between runs): 0.44

Sw(within run): 0.40

S/Sw:1.1

s.d.(BC) S(between runs): 0.27

Sw(within run): 0.20

S/Sw: 1.4

The calibration is accepted if the calibration control values obtained lie within the ranges:

78.06 - 81.94 for A+B
 46.55 - 49.45 for A-B
 19.11 - 20.86 for B+C
 11.35 - 12.65 for B-C

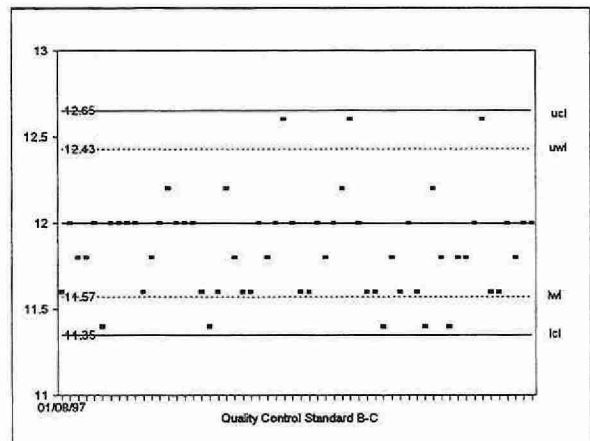
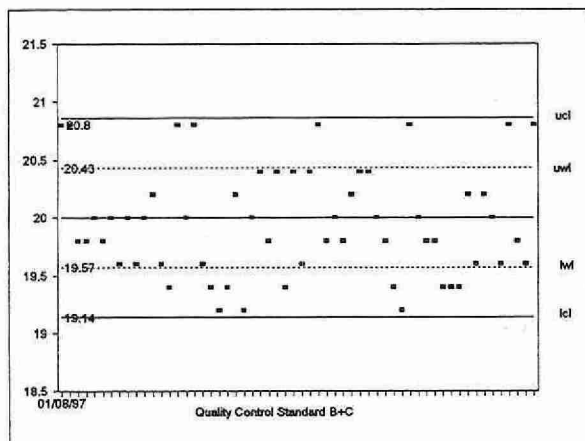
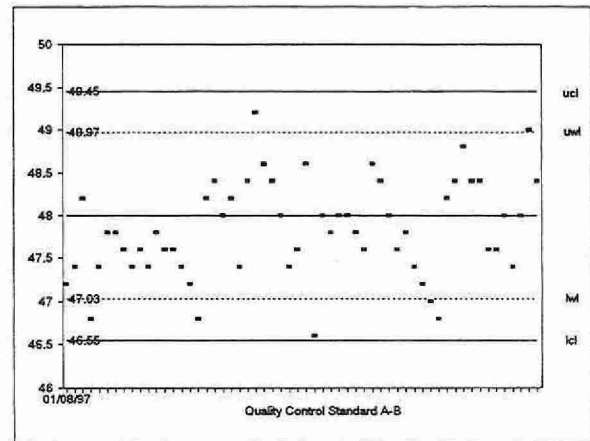
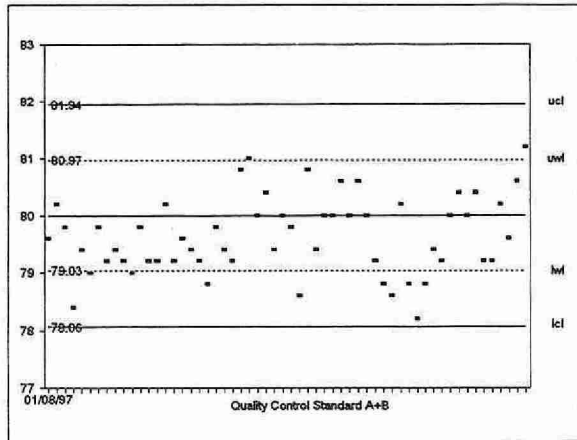
DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
56	0.00 - 8.00	0.3321	48.9
7	8.01 - 16.0	0.4037	3.6
67	16.1 - 40.0	0.3647	1.6
32	40.1 - 80.0	0.7361	1.3
162	Overall	0.4180	

OTHER CHECKS:

	n	Mean	Standard Deviation (1)
Long Term Blank	58	0.014	0.2698

Carbon, Dissolved Inorganic
Quality Control Data From 08/01/97 To 23/12/97
E3370A



CARBON, DISSOLVED ORGANIC

IDENTIFICATION:

Laboratory	Water Chemistry	Method Introduced	01/04/78
Method Reference No.	E3370A	Reporting Unit	mg/L as C
LIMS Product Code	DCSI3370	Supervisor	J. McBride
Sample Type/Matrix	Effluent, Industrial Waste, Process Water, Raw Sewage, Drinking Water Ground Water, Leachates, Precipitation, Surface Water		

SAMPLING:

Quantity Required	10 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

Using an automated system, the supernatant from a settled sample is acidified and flushed with nitrogen gas to remove inorganic carbon. Organic carbon is then oxidized to carbon dioxide gas by exposure to ultra-violet light (UV) in acid-persulphate media. The gas then passes through a gas-permeable membrane into a weakly-buffered alkaline phenolphthalein solution. The decrease in absorbance of this coloured solution is a measure of the dissolved organic carbon content of the sample.

Approximate absorbance: 0.3 at the full scale level.

Dissolved inorganic carbon, and reactive silicates are determined simultaneously.

INSTRUMENTATION:

Basic automated modular continuous flow system plus the following modules: nitrogen and air (CO₂-free) supplies with flow controls, dialysis unit, UV digester. Colourimetric measurement is through a 5.0 cm. light path at 550 nm. Data capture, reduction, and processing via a multi-stage microcomputer system.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.1	Current T value: 0.5
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CALIBRATION:

BL plus 7 standards

CONTROLS:

Calibration	LTBL plus 3 standards, e.g., QCA
Drift	BL every 10 samples; 2 standards every 20 samples.

CARBON, DISSOLVED ORGANIC (E3370A)

QUALITY CONTROL DATA FROM 08/01/97 TO 23/12/97

Full Scale: to 20.0 mg/L as C

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	58	16.0	16.06	0.06	0.1109
B:	58	4.00	4.01	0.01	0.0782
C:	58	1.00	0.97	-0.03	0.0883
A+B:	58	20.0	20.06	0.06	0.1471
A-B:	58	12.0	12.05	0.05	0.1231
B+C:	58	5.00	4.97	-0.03	0.1222
B-C:	58	3.00	3.04	0.04	0.1135

s.d.(AB) S(between runs): 0.0959

Sw(within run): 0.0871

S/Sw: 1.1

s.d.(BC) S(between runs): 0.0834

Sw(within run): 0.0802

S/Sw: 1.0

The calibration is accepted if the calibration control values obtained lie within the ranges:

19.44	-	20.56	for	A+B
11.58	-	12.42	for	A-B
4.72	-	5.28	for	B+C
2.79	-	3.21	for	B-C

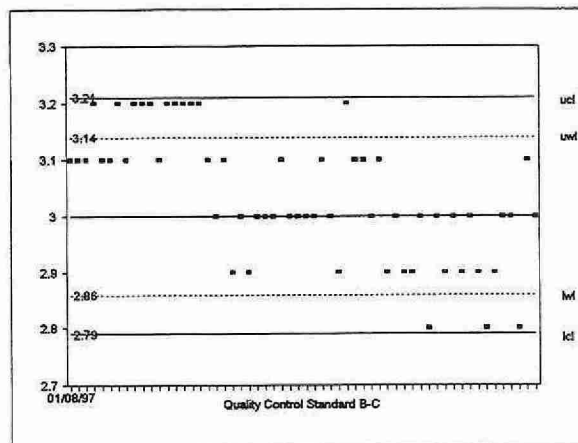
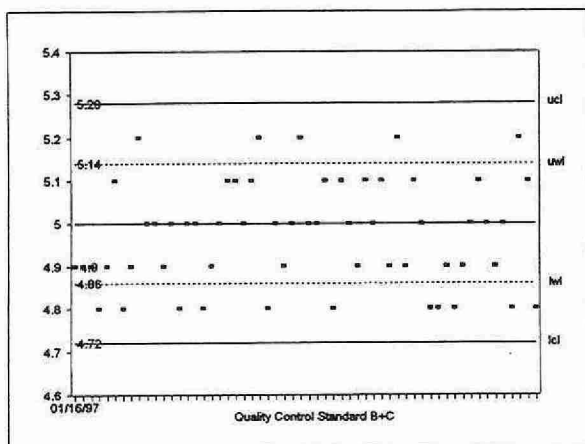
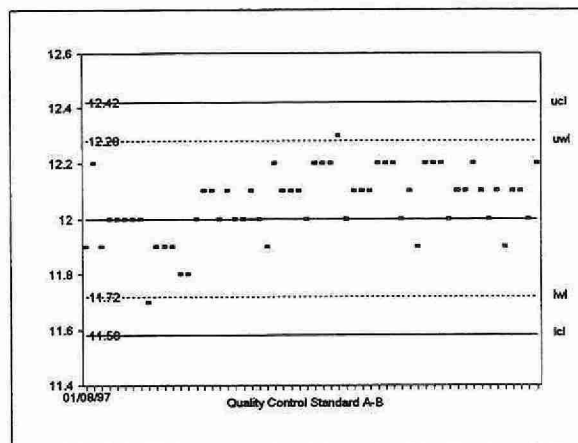
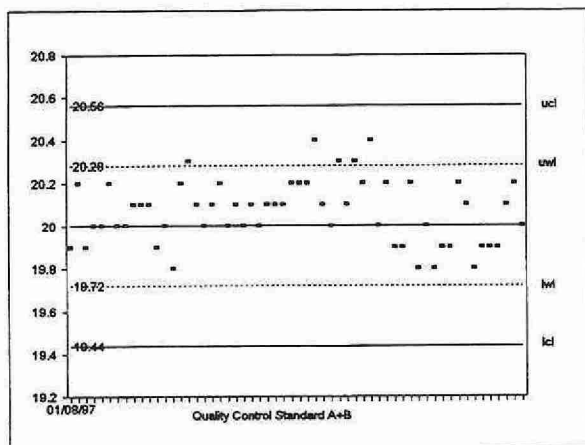
DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
46	0.00 - 2.00	0.0950	6.6
55	2.01 - 4.00	0.0797	2.9
51	4.01 - 10.0	0.1321	2.3
11	10.1 - 20.0	0.1884	1.3
163	Overall	0.1074	

OTHER CHECKS:

	n	Mean	Standard Deviation (1)
Long Term Blank	58	0.0552	0.0841

Carbon, Dissolved Organic
Quality Control Data From 08/01/97 To 23/12/97
E3370A



CHLORIDE

IDENTIFICATION:

Laboratory	Water Chemistry	Method Introduced	01/04/78
Method Reference No.	E3004A	Reporting Unit	$\mu\text{g}/\text{m}^3$ as Cl
LIMS Product Code	ANION3004	Supervisor	J. McBride
Sample Type/Matrix	Air; HiVol Glass Fibre, Quartz and Polyflon, Other Filters and Puff		

SAMPLING:

Quantity Required	3/4" or 1.9cm strip from 8"x10" filter
Container	50 mL polypropylene tube

SAMPLING PREPARATION:

A 3/4" filter strip is cut in pieces and deposited into a 50 mL polypropylene tube. 50 mL of Pure-Water is added to the tube. The tube is placed on a horizontal shaker for approximately 1 hour. The supernatant is then filtered into a 15 mL plastic tube and analysed.

ANALYTICAL PROCEDURE:

Chloride is separated from other anions in the sample by automated suppressed ion chromatography using an eluent mixture of sodium bicarbonate and sodium carbonate and a conductivity detector. The concentration of chloride (mg/L) is determined by the comparison of the analyte peak area count to that of a series of standards. The analyte result is corrected for the filter blank before the final calculation. The result is reported as $\mu\text{g}/\text{m}^3$ as Cl.

Nitrate and sulphate are determined simultaneously.

INSTRUMENTATION:

Horizontal Shaker, ion chromatographic system plus a PC with ChromPerfect software and DT2804 card for automated sample injection, timing, and data processing.

REPORTING:

Maximum Significant Figures: 2	Current W value: $0.1 \mu\text{g}/\text{m}^3$	Current T value: $0.5 \mu\text{g}/\text{m}^3$
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CALIBRATION:

6 standards

CONTROLS:

Calibration	MB, IS(n), CS1, and CS2
Drift	Duplicate plus 2 standards approximately every 20 samples

CHLORIDE cont'd

NOTES:

Duplicate criterion is based on duplicate analysis of the same filter because duplicate filters are not received. To convert unit from mg/L to $\mu\text{g}/\text{m}^3$, the final concentration of Cl in mg/L is multiplied by the following formula:

$$\text{Result}(\text{mg/L}) \times 50\text{mL} \times (63/6.75) / \text{air volume} = \mu\text{g./m}^3$$

Where: 63 is the area of the filter exposed and 6.75 is the sample aliquot are (in^2)

CHLORIDE (E3004A)

QUALITY CONTROL DATA FROM 01/01/97 TO 24/12/97

Analytical Range: to 50 mg/L

DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
64	0.00 - 10.0	0.0720	6.7
5	10.1 - 25.0	0.1463	0.8
2	25.1 - 50.0	N.A.	N.A.
71	Overall	0.0889	

CHLORIDE

IDENTIFICATION:

Laboratory	Water Chemistry	Method Introduced	01/05/75
Method Reference No.	E3016A	Reporting Unit	mg/L as Cl
LIMS Product Code	CL3016	Supervisor	J. McBride
Sample Type/Matrix	Effluent, Industrial Waste, Process Water, Raw Sewage, Drinking Water, Ground Water, Leachate, Surface Water		

SAMPLING:

Quantity Required:	10 mL
Container:	Plastic

ANALYTICAL PROCEDURE:

Chloride ions are combined with mercuric thiocyanate releasing thiocyanate quantitatively. Thiocyanate then reacts with ferric ions to produce ferric thiocyanate (red), and the absorbance of the latter is measured colourimetrically.

Approximate absorbance: 0.5 at the full scale level.

INSTRUMENTATION:

Basic automated modular continuous flow system with colourimetric measurement through a 1.5 cm light path at 480 nm.

Data capture, reduction, and processing via a multistage microcomputer system.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.2	Current T value: 1
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CALIBRATION:

BL plus 10 standards

CONTROLS:

Calibration:	LTBL plus 3 standards, e.g. QCA
Drift:	BL every 10 samples; standard every 20 samples

CHLORIDE (E3016A)

QUALITY CONTROL DATA FROM 03/01/97 TO 24/12/97

Full Scale: to 100 mg/L as Cl

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	70	75.00	75.32	0.32	0.3743
B:	70	25.00	25.10	0.10	0.1813
C:	70	5.00	5.06	0.06	0.1367
A+B:	70	100.00	100.42	0.42	0.4505
A-B:	70	50.00	50.21	0.21	0.3781
B+C:	70	30.00	30.16	0.16	0.2746
B-C:	70	20.00	20.05	0.05	0.1665

s.d.(AB) S(between runs):0.29

Sw(within run): 0.27

S/Sw: 1.1

s.d.(BC) S(between runs):0.16

Sw(within run): 0.12

S/Sw: 1.4

The calibration is accepted if the calibration control values obtained lie within the ranges:

98.7	-	101.3	for	A+B
49.0	-	51.0	for	A-B
29.3	-	30.7	for	B+C
19.5	-	20.5	for	B-C

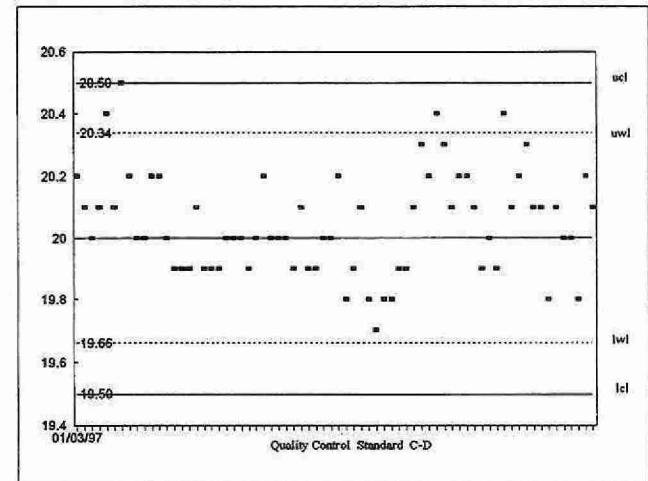
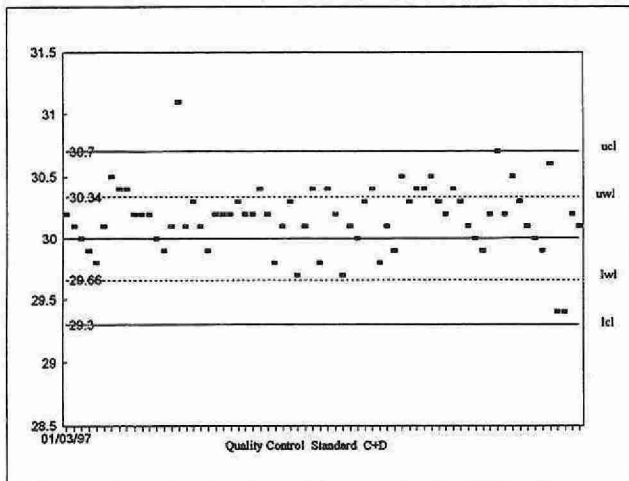
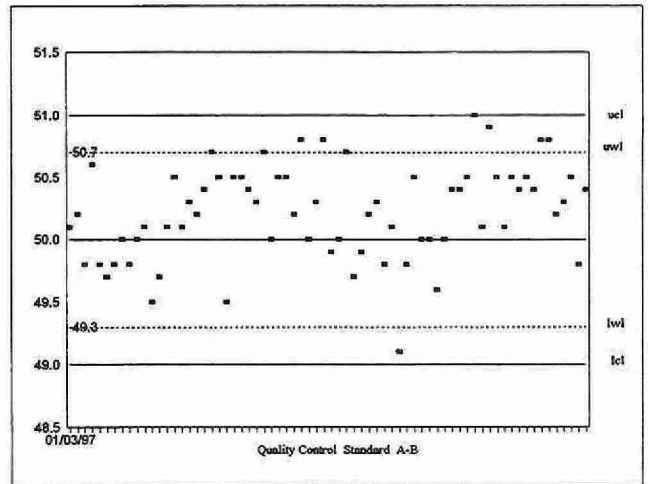
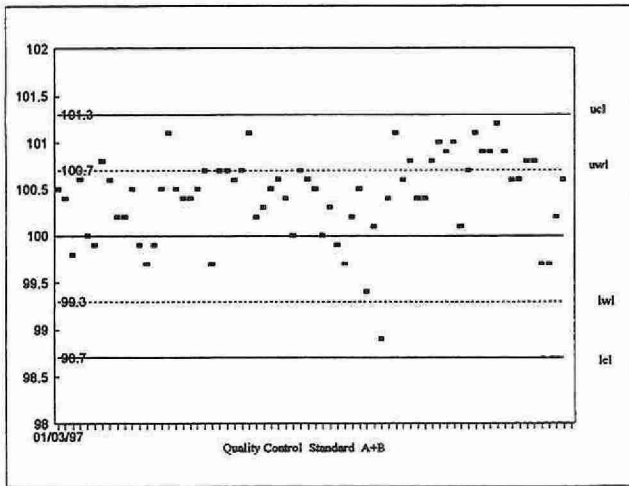
DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
61	0.00 - 10.0	0.1265	7.3
42	10.1 - 20.0	0.1369	1.4
53	20.1 - 50.0	0.2274	1.0
18	50.1 - 100	0.2489	0.7
174	Overall	0.1725	

OTHER CHECKS:

	n	Mean	Standard Deviation (1)
Long Term Blank	70	-0.020	0.1451

Chloride (mg/L as Cl)
Quality Control Data From 03/01/97 To 24/12/97
E3016A



CHLORIDE

IDENTIFICATION:

Laboratory	Dorset	Method Introduced	01/04/78
Method Reference No.	E3147A	Reporting Unit	mg/L as Cl
LIMS Product Code	ANION3147	Supervisor	F. Tomassini
Sample Type/Matrix	Precipitation, Leachate, Surface Water		

SAMPLING:

Quantity Required	15 mL
Container	Glass or Plastic

ANALYTICAL PROCEDURE:

Chloride is separated from other anions in the sample by automated suppressed ion chromatography using an eluent mixture of 0.003 M sodium bicarbonate and 0.0024 M sodium carbonate with conductivity detection. Samples are spiked with $\text{Na}_2\text{CO}_3/\text{NaHCO}_3$ to match the eluent strength and maintain background conductivity. The concentration of chloride in mg/L as Cl is determined by the comparison of the sample peak heights to a series of standards.

Sulphate is determined simultaneously.

INSTRUMENTATION:

Modular continuous flow ion chromatographic system plus microcomputer for automated sample injection, timing, and partial data processing.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.01	Current T value: 0.05
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CALIBRATION:

BL plus 7 standards

CONTROLS:

Calibration	LTBL plus 2 standards, e.g., QCA
Drift	1 standard every 10 samples.

CHLORIDE (E3147A)

QUALITY CONTROL DATA FROM 09/01/97 TO 22/12/97

Full Scale: to 2.0 mg/L as Cl

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	32	1.60	1.608	0.008	0.0151
B:	32	0.40	0.408	0.008	0.0112
A+B:	32	2.00	2.018	0.018	0.0147
A-B:	32	1.20	1.198	-0.002	0.0113

s.d.(AB) S(between runs): 0.014

Sw(within run): 0.012

S/Sw: 1.15

The calibration is accepted if the calibration control values obtained lie within the ranges:

1.92 - 2.08 for A+B
1.14 - 1.26 for A-B

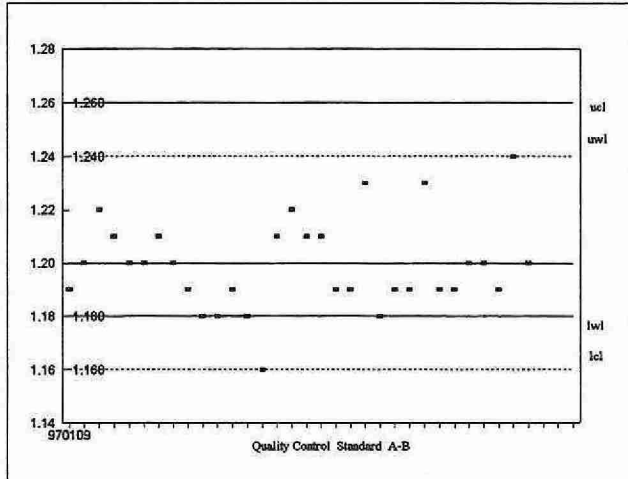
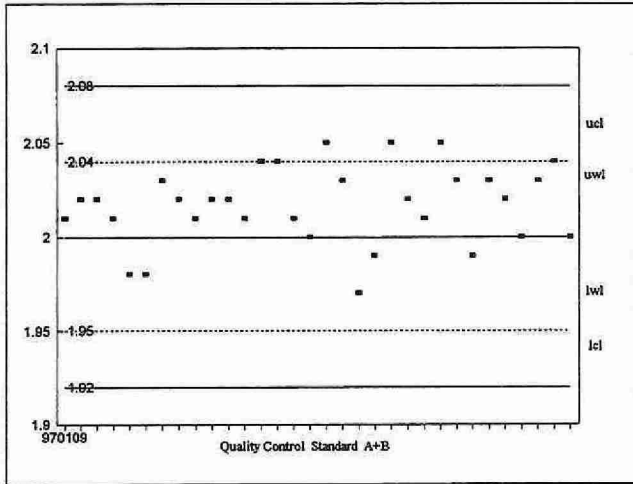
DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
34	0.10 - 0.20	0.0076	7.2
47	0.21 - 0.40	0.0080	3.1
24	0.41 - 1.00	0.0131	2.1
10	1.01 - 2.00	0.0124	0.8
115	Overall	0.0095	

OTHER CHECKS:

	n	Mean	Standard Deviation (1)
Long Term Blank	32	-0.0066	0.0225

Chloride (mg/L as Cl)
Quality Control Data From 09/01/97 To 22/12/97
E3147A



CHLORIDE

IDENTIFICATION:

Laboratory	Water Chemistry	Method Introduced	01/04/78
Method Reference No	E3148A	Reporting Unit	µg/Filter as Cl
LIMS Product Code	LOV3148, ANLOV3148	Supervisor	J. McBride
Sample Type/Matrix	Air; Sequential and LoVol filters		

SAMPLING:

Quantity Required	1 filter
Container	50 mL polypropylene tube

SAMPLE PREPARATION:

Filters are extracted with 50.0 mL of DDW in polypropylene tubes with ultrasonic treatment followed by a 24 hour rest period.

ANALYTICAL PROCEDURE:

Chloride is separated from other anions in the sample by automated suppressed ion chromatography using an eluent mixture of 0.003 M sodium bicarbonate and 0.0024 M sodium carbonate with conductivity detection. Samples are spiked with $\text{Na}_2\text{CO}_3/\text{NaHCO}_3$ to match the eluent strength and maintain background conductivity. The concentration of chloride in mg/L as Cl is determined by the comparison of the sample peak heights to a series of standards. Results are converted to µg/filter as Cl. Nitrogen-nitrate and sulphate are determined simultaneously.

INSTRUMENTATION:

Ultrasonic bath; modular continuous flow ion chromatographic system plus microcomputer for automated sample injection, timing and partial data processing.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.02 mg/L	Current T value: 0.10 mg/L
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CALIBRATION:

BL plus 9 standards

CONTROLS:

Calibration	LTBL plus 2 standards, e.g. QCA
Drift	1 standard every 10 samples

NOTES:

Detection criterion is based on duplicate analyses of the extract from one filter because duplicate filters are not received. To convert unit from mg/L to µg/Filter, the concentration of Cl in mg/L is multiplied by 50 for the W40 filters.

CHLORIDE (E3148A)

QUALITY CONTROL DATA FROM 16/01/97 TO 09/12/97

Full Scale: to 2.0 mg/L as Cl

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	21	1.60	1.593	-0.007	0.0092
B:	21	0.40	0.388	-0.122	0.0145
A+B:	21	2.00	1.981	-0.019	0.0160
A-B:	21	1.20	1.205	0.005	0.0182

s.d.(AB) S(between runs): 0.0121 Sw(within run): 0.0129 S/Sw: 0.9

The calibration is accepted if the calibration control values obtained lie within the ranges:

1.93 - 2.07 for A+B
1.15 - 1.25 for A-B

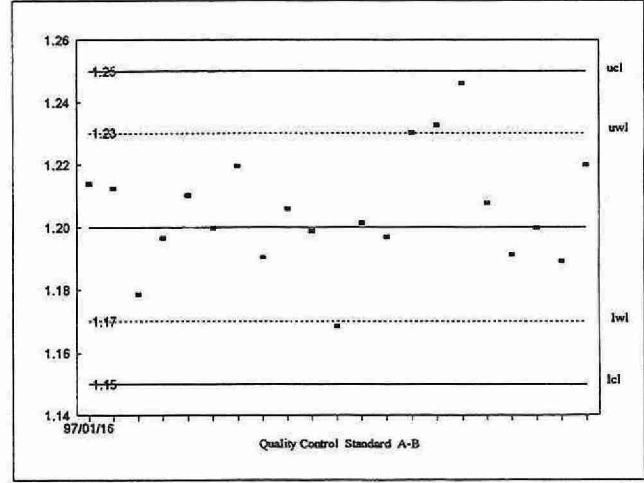
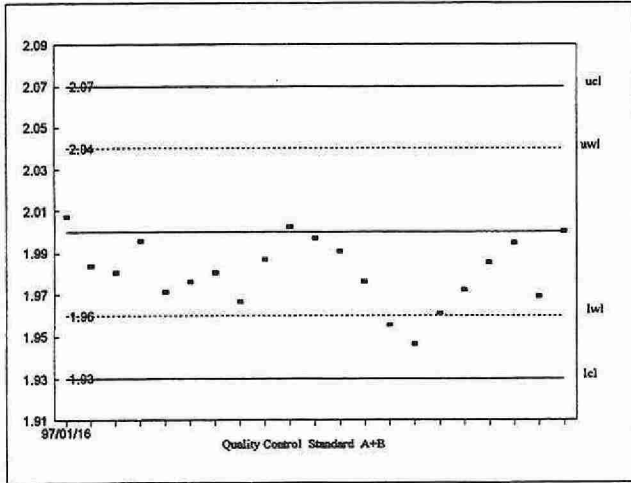
DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
4	0 - 0.40	0.0035	1.9
17	0.41 - 1.00	0.0073	1.1
2	1.01 - 2.00	0.0010	0.1
23	Overall	0.0064	

OTHER CHECKS:

	n	Mean	Standard Deviation (1)
Long Term Blank	21	0.0024	0.0077

Chloride (mg/L as Cl)
Quality Control Data From 16/01/97 To 09/12/97
E3148A



CHLORIDE

IDENTIFICATION:

Laboratory	Water Chemistry	Method Introduced	01/04/78
Method Reference No	E3372A	Reporting Unit	mg/L as Cl
LIMS Product Code	ANION3372	Supervisor	J. McBride
Sample Type/Matrix	Precipitation		

SAMPLING:

Quantity Required	15 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

Chloride is separated from other anions in the sample by automated suppressed ion chromatography using an eluent mixture of 0.003 M sodium bicarbonate and 0.0024 M sodium carbonate with conductivity detection. Samples are spiked with $\text{Na}_2\text{CO}_3/\text{NaHCO}_3$ to match the eluent strength and maintain background conductivity. The concentration of chloride in mg/L as Cl is determined by the comparison of the sample peak heights to a series of standards.

Nitrogen-nitrate and sulphate are determined simultaneously.

INSTRUMENTATION:

Modular continuous flow ion chromatographic system plus microcomputer for automated sample injection, timing, and partial data processing.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.01	Current T value: 0.05
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CALIBRATION:

BL plus 7 standards

CONTROLS:

Calibration	LTBL plus 2 standards, e.g. QCA
Drift	1 standard every 10 samples

NOTES:

Same analytical method as E3147A operating in Dorset Lab. New method number introduced for Toronto Lab in 1993 is E3372A.

CHLORIDE (E3372A)

QUALITY CONTROL DATA FROM 07/01/97 TO 23/12/97

Full Scale: to 1.0 mg/L as Cl

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	25	0.80	0.799	-0.001	0.0113
B:	25	0.20	0.201	0.001	0.0084
A+B:	25	1.00	1.000	0.000	0.0162
A-B:	25	0.60	0.598	-0.002	0.0115

s.d.(AB) S(between runs): 0.010 Sw(within run): 0.008 S/Sw: 1.22

The calibration is accepted if the calibration control values obtained lie within the ranges:

0.96 - 1.04 for A+B
0.57 - 0.63 for A-B

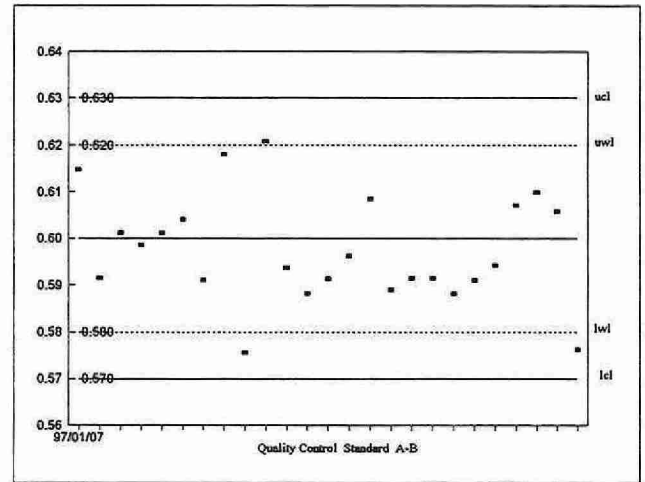
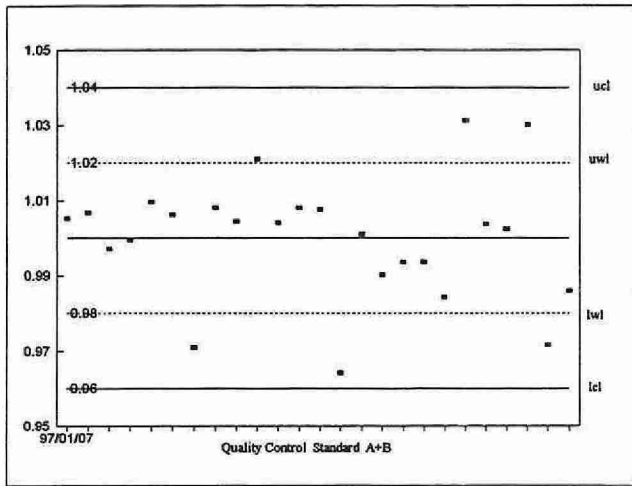
DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
26	0 - 0.20	0.0084	9.5
4	0.21 - 0.50	0.0088	2.4
1	0.51 - 1.00	0.0080	4.9
31	Overall	0.0087	6.0

OTHER CHECKS:

	n	Mean	Standard Deviation (1)
Long Term Blank	25	0.0038	0.0064

Chloride (mg/L as Cl)
Quality Control Data From 07/01/97 To 23/12/97
E3372A



CHLORINE, TOTAL RESIDUAL

IDENTIFICATION:

Laboratory	Water Chemistry	Method Introduced	08/03/93
Method Reference No.	E3309A	Reporting Unit	µg/L as Cl ₂
LIMS Product Code	RCL3309	Supervisor	J. McBride
Sample Type/Matrix	Effluent, Industrial Waste, Raw Sewage, Surface Water, Drinking Water		

SAMPLING:

Quantity Required:	1 L
Container:	Narrow neck low actinic glass

ANALYTICAL PROCEDURE:

Samples are analyzed by amperometric titration. The sample pH is adjusted to between 3.5 and 4.5 with acetate buffer and excess KI is added.

INSTRUMENTATION:

Autoburette

REPORTING:

Maximum Significant Figures: 3	Current W value: 2	Current T value: 10
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CALIBRATION:

None

CONTROLS:

Performance Check	BL plus 2 QC standards, e.g., QCA
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NOTES:

Results recorded for duplicates are based upon final concentrations. The results from various sample aliquots are indicated in each of the concentration spans.

CHLORINE, TOTAL RESIDUAL (E3309A)

QUALITY CONTROL DATA FROM 03/01/95 TO 29/07/98

Full Scale: to 50.0 µg/L as Cl₂

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	97	40.0	39.8	-0.2	1.5690
B:	97	10.0	10.6	0.6	1.2983
A+B:	97	50.0	50.3	0.3	2.4796
A-B:	97	30.0	29.1	-0.9	1.4072

s.d.(AB) S(between runs): 1.44

Sw(within run): 1.01

S/Sw: 1.4

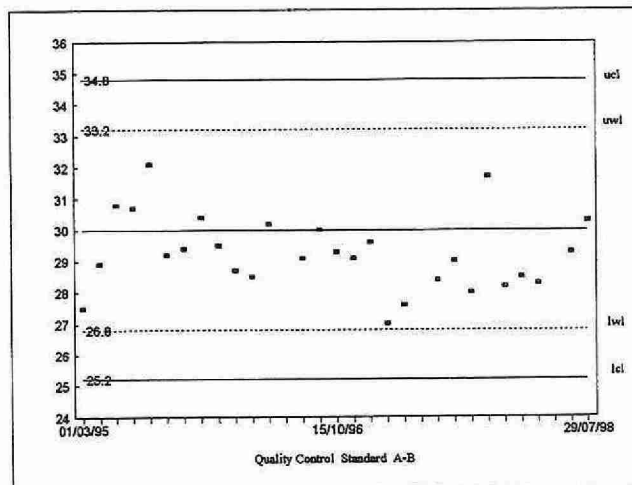
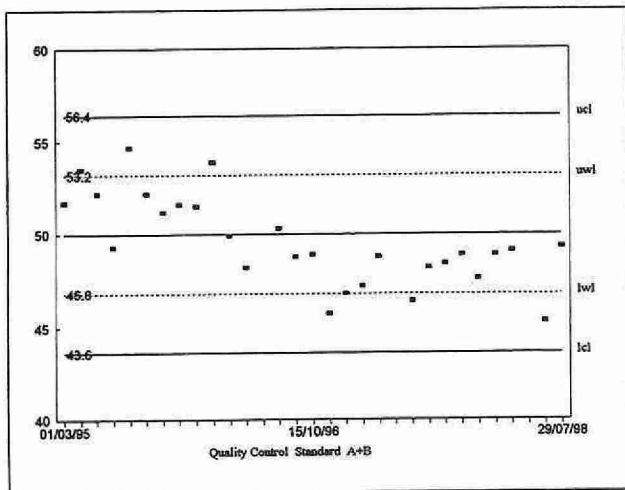
The calibration is accepted if the calibration control values obtained lie within the ranges:

43.6 - 56.4 for A+B
25.2 - 34.8 for A-B

DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
10	0 - 10	0.7091	11.9
21	11 - 25	0.5987	4.3
24	26 - 50	1.5703	5.2
13	51 - 100	2.9349	6.8
30	101 - 700	16.399	17.3
98	Overall	3.5600	

Chlorine Total Residual (ug/L as Cl₂)
Quality Control Data From 01/03/95 To 29/07/98
E3309A



CHLOROPHYLL

IDENTIFICATION:

Laboratory	Water Chemistry	Method Introduced	01/04/75
Method Reference No	E3169A	Reporting Unit	µg/L
LIMS Product Code	CHL3169	Supervisor	J. McBride
Sample Type/Matrix	Effluent, Drinking Water, Surface Water		

SAMPLING:

Quantity Required	1000 mL for clear samples; 500 mL if visibly green
Container	Glass or plastic
Other	In the field a sample is filtered through a nylon filter. The filter is folded and then placed between two membrane filter-support pads, and the package is enclosed in a plastic dish labelled with the sample number and sample volume filtered, the dish is kept in the dark or wrapped in aluminum foil, and shipped immediately, or kept frozen.

ANALYTICAL PROCEDURE:

Using a Commodore PET microcomputer-controlled, automated spectrophotometer, two scans are developed with absorbance measurements at 630, 645, and 663 nm for the first scans; the minimum absorbance value between 710 and 750 nm (readings at 5 nm intervals) is utilized as a turbidity correction. Chlorophyll "a" and "b" are calculated from this scan. After automated acidification, the second scan is obtained from the wavelength 665 nm for correcting chlorophyll "a" measurement. SCOR-UNESCO equations are used for all chlorophyll calculations.

INSTRUMENTATION:

- Automated modular continuous flow scanning spectrophotometer system
- Microcomputer system for control of sampling, timing and data processing (i.e. data capture, calculations and transfer of results to LIMS)

REPORTING:

Chlorophyll a; corrected	Maximum Significant Figures: 3	Current W value: 1.0	Current T value: 5.0
Chlorophyll a; total		Current W value: 0.2	Current T value: 1.0
Chlorophyll b; total		Current W value: 0.1	Current T value: 0.5

CONTROLS:

Calibration	LTBL plus 2 "standards", e.g.QCA
Drift	"standard", BL every 20 samples

NOTES:

"Standards" are prepared from chlorophyll "a" and "b", but the materials are neither analytical grade nor are their solutions stable. Thus calibration controls are based on measured averages.

CHLOROPHYLL "a" (E3169A)

QUALITY CONTROL DATA FROM 07/01/97 TO 19/12/97

Reporting Unit: $\mu\text{g/L}$

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	36	3.0	2.950	-0.050	0.1827
B:	36	1.0	0.975	-0.025	0.1212
A+B:	36	4.0	3.925	-0.075	0.2626
A-B:	36	2.0	1.975	-0.025	0.1648

s.d.(AB)

S(between runs): 0.16

Sw(within run): 0.12

S/Sw: 1.3

The calibration is accepted if the calibration control values obtained lie within the ranges:

3.6 - 4.4 for A+B
1.7 - 2.3 for A-B

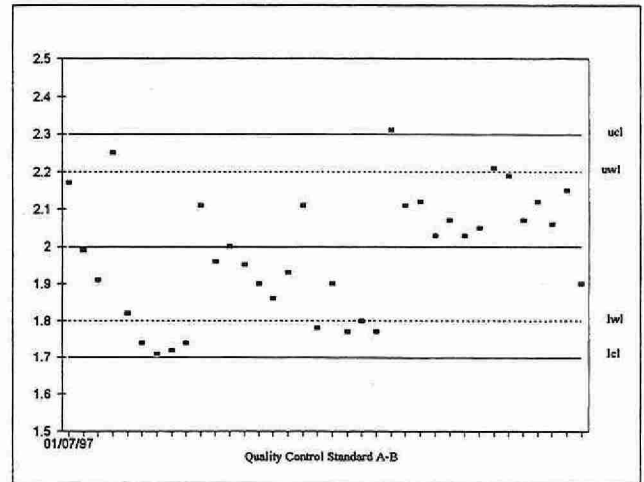
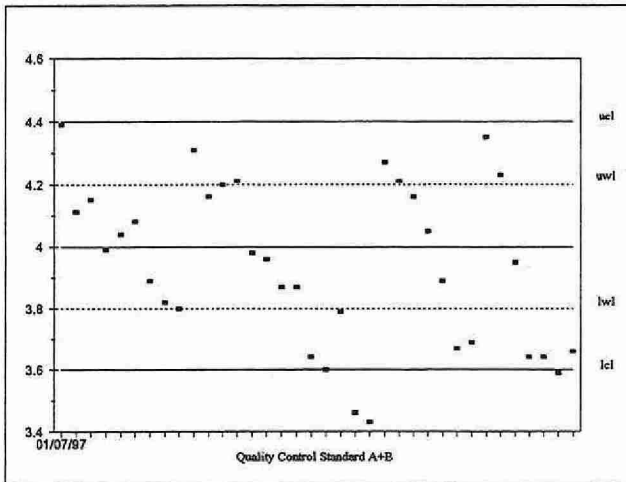
DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
69	0 - 5.0	0.1634	15.4
6	5.1 - 10.0	0.5465	7.5
8	10.1 - 25.0	0.5368	3.7
83	Overall	0.2675	

OTHER CHECKS:

	n	Mean	Standard Deviation (1)
Long Term Blank	36	0.054	0.0784
Filtered Blank	36	0.055	0.0422

Chlorophyll , "a" (ug/L)
Quality Control Data From 07/01/97 To 19/12/97
E3169A



CHLOROPHYLL "a", ACIDIFIED (E3169A)

QUALITY CONTROL DATA FROM 07/01/97 TO 19/12/97

Reporting Unit: µg/L

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	37	2.4	2.467	0.067	0.2118
B:	37	0.8	0.743	-0.057	0.1295
A+B:	37	3.2	3.210	0.210	0.2837
A-B:	37	1.6	1.724	0.124	0.2068

s.d.(AB) S(between runs): .18

Sw(within run): 0.15

S/Sw: 1.2

The calibration is accepted if the calibration control values obtained lie within the ranges:

2.4 - 4.0 for A+B
1.0 - 2.2 for A-B

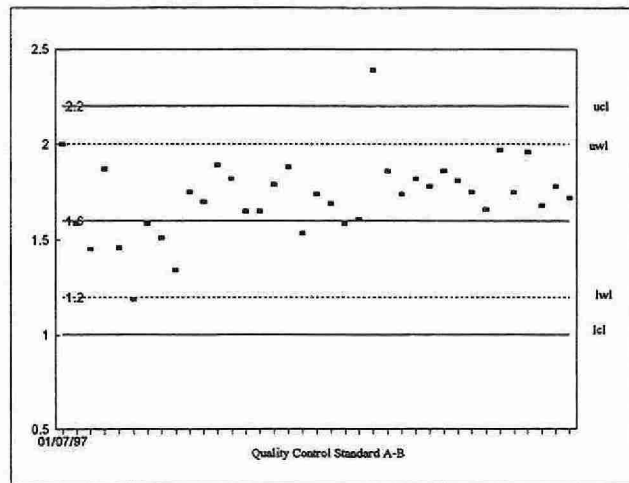
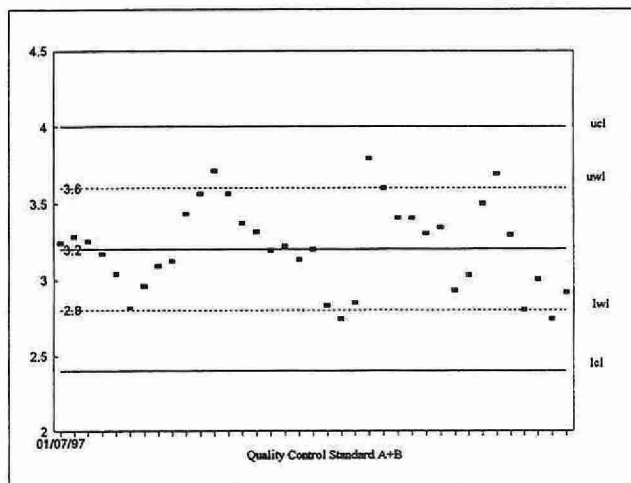
DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
60	-0.34 - 1.0	0.1423	106.4
4	1.1 - 2.0	0.2303	15.7
11	2.1 - 5.0	0.6046	21.0
7	5.1 - 10.0	0.5581	7.5
4	10.1 - 100	1.0540	7.8
86	Overall	0.3747	

OTHER CHECKS:

	n	Mean	Standard Deviation (1)
Long Term Blank	37	-0.0420	0.1246
Filtered Blank	37	-0.0592	0.0971

Chlorophyll "a", Acidified (ug/L)
Quality Control Data From 07/01/97 To 19/12/97
E3169A



CHLOROPHYLL "b" (E3169A)

QUALITY CONTROL DATA FROM 07/01/97 TO 19/12/97

Reporting Unit: µg/L

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	37	3.0	3.008	0.008	0.1871
B:	37	1.0	1.060	0.060	0.1449
A+B:	37	4.0	4.060	0.060	0.2807
A-B:	37	2.0	1.941	-0.059	0.1822

s.d.(AB) S(between runs):0.17

Sw(within run): 0.13

S/Sw: 1.3

The calibration is accepted if the calibration control values obtained lie within the ranges:

3.6 - 4.4 for A+B
1.7 - 2.3 for A-B

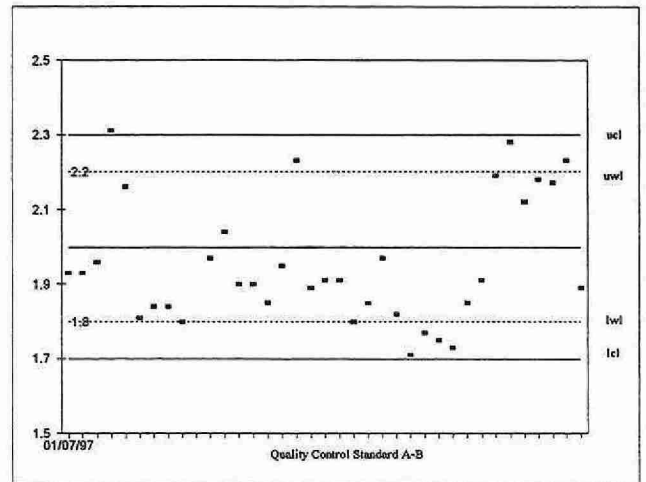
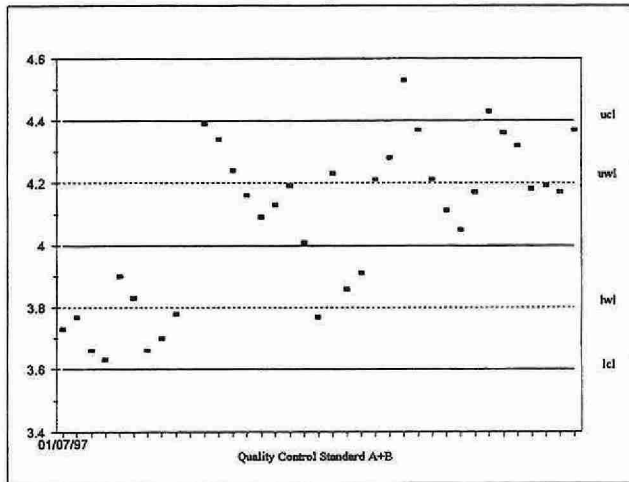
DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
79	-0.25 - 1.0	0.1246	32.6
7	1.1 - 2.0	0.1712	13.7
0	2.1 - 5.0	N.A.	N.A.
86	Overall	0.1158	

OTHER CHECKS:

	n	Mean	Standard Deviation (1)
Long Term Blank	37	0.084	0.1385
Filtered Blank	37	0.088	0.0480

Chlorophyll, "b" (ug/L)
Quality Control Data From 07/01/97 To 19/12/97
E3169A



COLOUR, TRUE

IDENTIFICATION:

Laboratory	Dorset	Method Introduced	15/10/80
Method Reference No.	E3025A	Reporting Unit	TCU
LIMS Product Code	COL3025	Supervisor	F. Tomassini
Sample Type/Matrix	Leachate, Precipitation, Surface Water		

SAMPLING:

Quantity Required:	25 mL
Container:	Glass or plastic

ANALYTICAL PROCEDURE:

True colour is measured on a settled sample colourimetrically in a system calibrated with acidified chloroplatinate standards. Colour is measured using a 400-450 nm broadband blue filter.
Approximate absorbance: 0.20 at the full scale level.

INSTRUMENTATION:

One colourimeter with broadband blue filter (400-450 nm)
One autosampler and chart-recorder
One Gilson pump

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.2	Current T value: 1
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CALIBRATION:

6 acidified chloroplatinate standards, 10, 20, 40, 60, 80, 100 TCU

CONTROLS:

Calibration	LTBL plus 3 standards, e.g. QCA, QCB, QCC
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NOTES:

Slope factor is changed whenever light source in a colourimeter or cell is replaced. This is accomplished by analyzing 7 standards.

COLOUR, TRUE (E3025A)

QUALITY CONTROL DATA FROM 10/01/97 TO 19/12/97

Analytical Range: to 100 TCU

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	32	75	75.6	0.5	0.6420
B:	32	25	25.8	0.3	0.3822
C:	32	5	5.29	-0.2	0.3636
A+B:	32	100	100.8	0.8	0.9058
A-B:	32	50	50.2	0.2	0.5768
B+C:	32	30	30.1	0.1	0.7299
B-C:	32	20	20.5	0.5	0.4125

s.d.(AB) S(between runs): 0.53

Sw(within run): 0.41

S/Sw: 1.3

s.d.(BC) S(between runs): 0.37

Sw(within run): 0.29

S/Sw: 1.3

On any given day the calibration is accepted if the calibration control values obtained lie within the ranges:

96.4	-	103.6	for	A+B
47.7	-	52.3	for	A-B
27.1	-	32.9	for	B+C
18.3	-	21.7	for	B-C

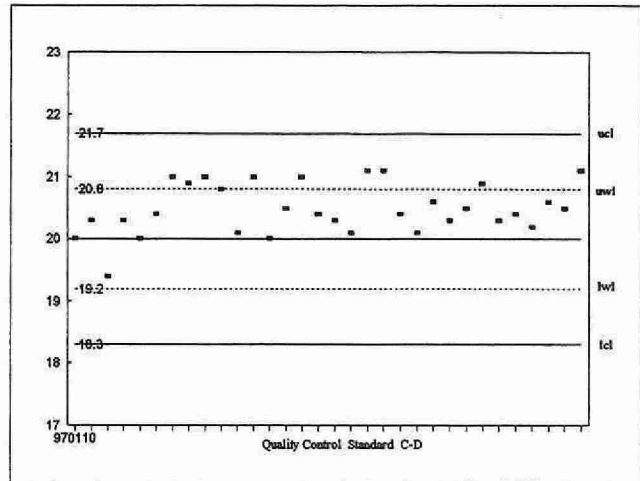
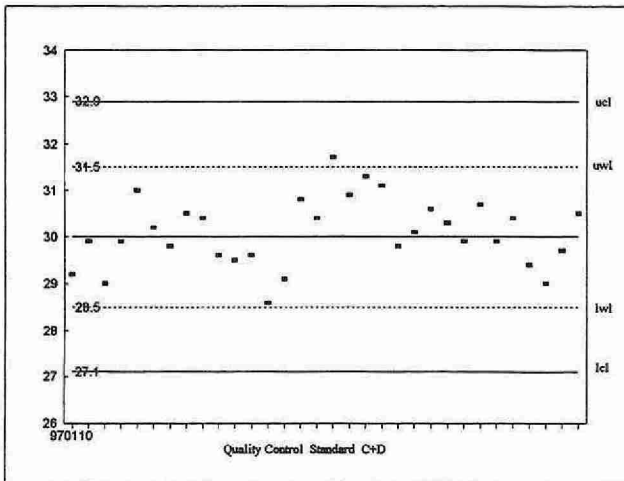
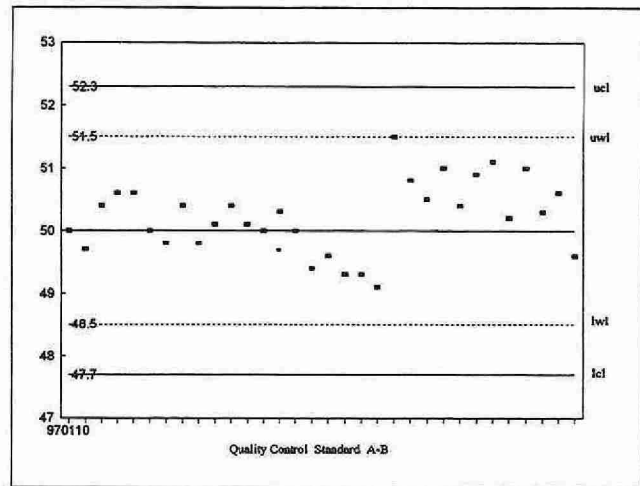
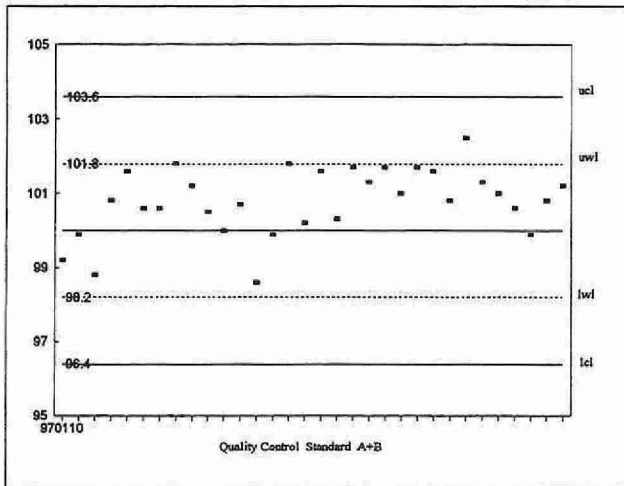
DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
19	0.0 - 10.0	0.2609	3.8
18	10.1 - 20.0	0.2390	1.6
67	20.1 - 50.0	0.2980	0.8
19	50.1 - 100.0	0.4556	0.7
123	Overall	0.3069	

OTHER CHECKS:

	n	Data Mean	Standard (1) Deviation
Long Term Blank	32	0.4937	0.3758

COLOR, TRUE (TCU)
Quality Control Data From 10/01/97 To 30/12/97
E3025A



COLOUR, TRUE

IDENTIFICATION:

Laboratory	Water Chemistry	Method Introduced	13/03/84
Method Reference No.	E3219A	Reporting Unit	TCU
LIMS Product Code	COL3219	Supervisor	J. McBride
Sample Type/Matrix	Effluent, Industrial Waste, Drinking Water, Ground Water, Leachate, Precipitation, Surface Water		

SAMPLING:

Quantity Required	50 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

True colour is measured colourimetrically on the supernatant of a settled sample in a system calibrated with acidified chloroplatinate standards. The sample stream is measured using a broadband blue filter. Residual turbidity effects are suppressed by using a broadband red filter and increased path length in the reference stream.

Approximate absorbance: 0.3 at the full scale level.

INSTRUMENTATION:

Basic automated modular continuous flow system. Colour measurement is through a 3.0 cm. light path using a broadband filter (400-450 nm). Turbidity measurement is through a 5.0 cm. light path using a different broadband filter (660-740 nm). Data capture, reduction, and processing via a multi-stage microcomputer system.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.2	Current T value: 1
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CALIBRATION:

BL plus 6 standards

CONTROLS:

Calibration	LTBL plus 2 standards, e.g. QCA
Drift	BL every 10 samples; standard every 20 samples

COLOUR, TRUE (E3219A)

QUALITY CONTROL DATA FROM 10/01/97 TO 19/12/97

Laboratory Unit: Colourimetry Analytical Range: to 100 TCU

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	47	70.0	69.97	-0.03	0.6043
B:	47	25.0	24.84	-0.16	0.4839
C:	47	7.5	7.36	-0.14	0.3221
A+B:	47	95.0	94.81	-0.19	0.9408
A-B:	47	45.0	45.13	0.13	0.5599
B+C:	47	32.5	32.20	-0.30	0.6953
B-C:	47	17.5	17.48	-0.02	0.4385

s.d.(AB) S(between runs): 0.43

Sw(within run): 0.40

S/Sw: 1.1

s.d.(BC) S(between runs): 0.23

Sw(within run): 0.31

S/Sw: 0.7

On any given day the calibration is accepted if the calibration control values obtained lie within the ranges:

92.2	-	97.8	for	A+B
42.9	-	47.1	for	A-B
30.6	-	34.3	for	B+C
16.1	-	18.9	for	B-C

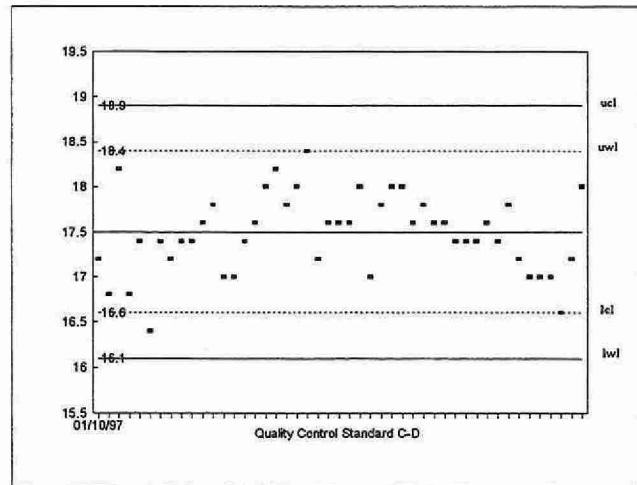
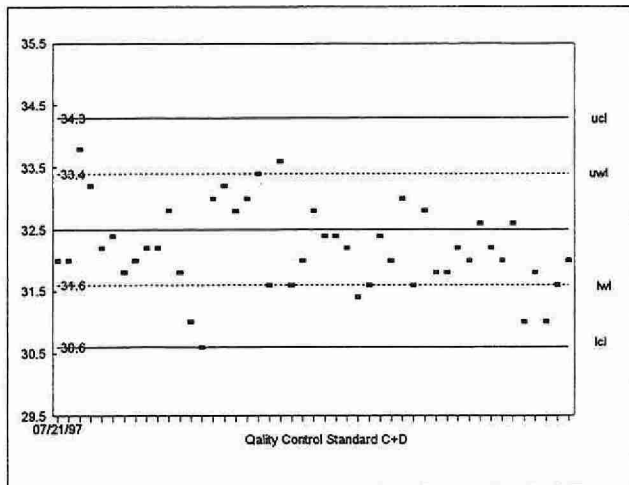
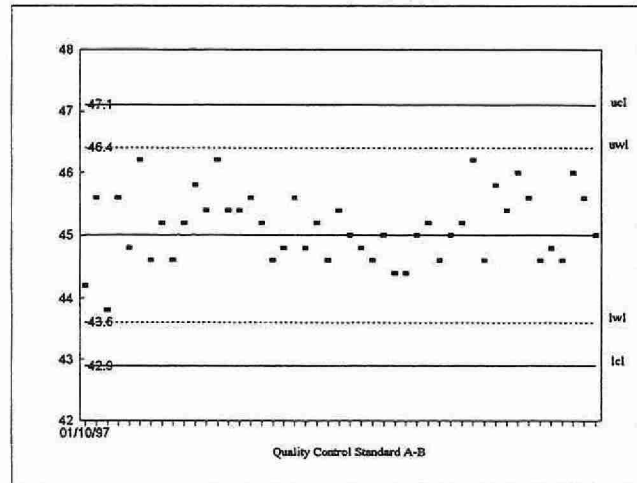
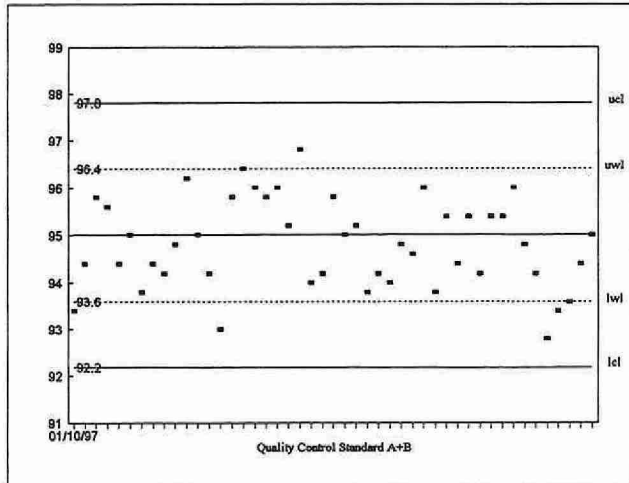
DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
97	0.0 - 10.0	0.44239	22.5
17	10.1 - 20.0	0.55055	4.8
19	20.1 - 50.0	0.55710	1.5
3	50.1 - 100.0	0.64798	0.9
136	Overall	0.47998	

OTHER CHECKS:

	n	Data Mean	Standard (1) Deviation
Long Term Blank	47	0.1574	0.4190

Colour, True (TCU)
Quality Control Data from 10/01/97 to 19/12/97
E3219A



CONDUCTIVITY

IDENTIFICATION:

Laboratory	Dorset	Method Introduced	01/06/76
Method Reference No.	E3024B	Reporting Unit	$\mu\text{S}/\text{cm}$ at 25°C
LIMS Product Code	COND3024	Supervisor	F. Tomassini
Sample Type/Matrix	Surface Water, Precipitation, Leachate		

SAMPLING:

Quantity Required	75 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

The sample is introduced into a jacketed conductivity cell. The conductivity is calculated from the chart record.

INSTRUMENTATION:

Conductivity meter with cell enclosed in a water jacket; temperature controlled water circulator. One autosampler, Gilson pump and dual-range chart recorder.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.2	Current T value: 1
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CALIBRATION:

5 KCl standards, 10.2, 30.6, 50.8, 101.1, 151 μS

CONTROLS:

Calibration	LTBL plus 4 standards, e.g. QCA
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NOTES:

The control standards are corrected for the LTB from which they are made.

CONDUCTIVITY (E3024B)

QUALITY CONTROL DATA FROM 10/01/97 TO 24/12/97

Analytical Range: to 500 μ S/cm

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	34	146.7	146.6	-0.1	0.4178
B:	34	51.8	51.81	0.01	0.3553
C:	34	51.8	51.9	0.1	0.3247
D:	34	14.9	14.7	-0.2	0.4008
A+B:	34	198.5	198.2	-0.3	0.6579
A-B:	34	94.9	94.8	-0.1	0.4110
C+D:	34	66.7	66.5	-0.2	0.5489
C-D:	34	36.9	36.96	0.06	0.4806

s.d.(AB) S(between runs): 0.39

Sw(within run): 0.29

S/Sw: 1.3

s.d.(CD) S(between runs): 0.36

Sw(within run): 0.34

S/Sw: 1.1

On any given day the calibration is accepted if the calibration control values obtained lie within the ranges:

195	-	202	for	A+B
92.2	-	97.6	for	A-B
64.9	-	68.5	for	C+D
35.6	-	38.2	for	C-D

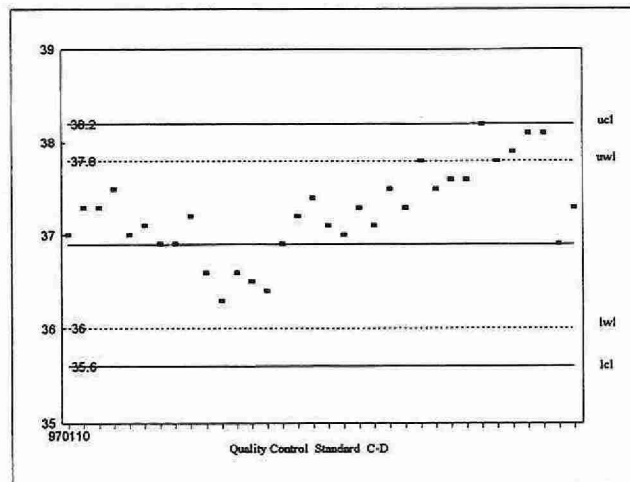
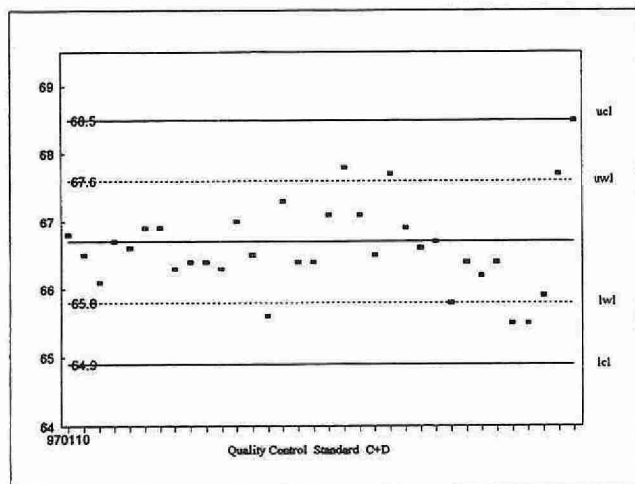
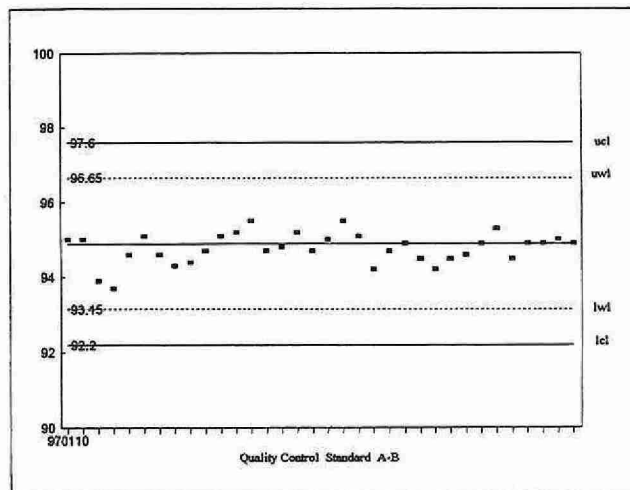
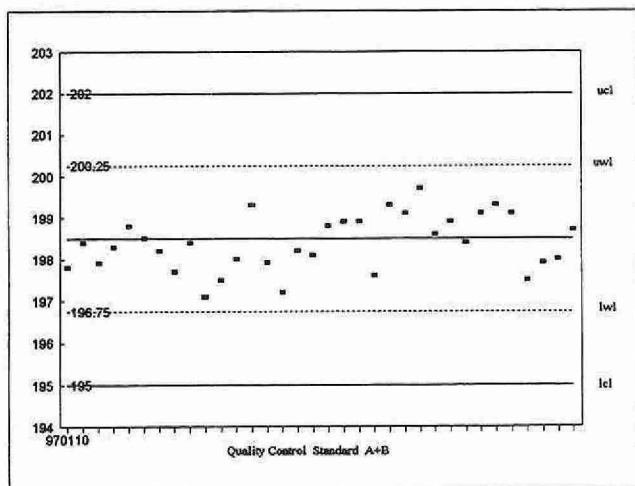
DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
17	0.00 - 50.0	0.1058	0.8
93	50.1 - 100.0	0.2261	1.0
22	100.1 - 250.0	0.3461	0.5
3	250.1 - 500.0	0.3845	0.3
135	Overall	0.2377	

OTHER CHECKS:

	n	Mean	Standard Deviation (1)
Long Term Blank	34	0.8210	0.3050

Conductivity (us/cm)
Quality Control Data From 10/01/97 To 24/12/97
E3024B



CONDUCTIVITY

IDENTIFICATION:

Laboratory	Water Chemistry	Method Introduced:	01/04/78
Method Reference No.	E3177A	Reporting Unit:	$\mu\text{S}/\text{cm}$ at 25°C
LIMS Product Code	COND3177	Supervisor:	J. McBride
Sample Type/Matrix	Precipitation		

SAMPLING:

Quantity Required:	15 mL
Container:	Glass or plastic

ANALYTICAL PROCEDURE:

After equilibration at 25°C, The conductivity of the sample is measured.

INSTRUMENTATION:

Automated modular continuous flow conductivity system comprised of sampler, water bath, conductivity meter with cell, chart recorder.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.2	Current T value: 1
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CALIBRATION:

1 standard

CONTROLS:

Calibration:	LTBL plus 2 standards, e.g. QCA
Drift:	1 solution every 10 samples

NOTES:

A calibration standard for the ion chromatographic system is used to monitor the drift for the conductivity system, but its theoretical conductivity is unknown.

CONDUCTIVITY (E3177A)

QUALITY CONTROL DATA FROM 07/01/97 TO 23/12/97

Full Scale: to 100.0 $\mu\text{S}/\text{cm}$

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	15	44.5	46.27	1.77	0.7166
B:	15	7.5	8.83	1.33	0.3173
A+B:	15	52.0	55.10	3.10	0.9103
A-B:	15	37.0	37.45	0.45	0.6323

s.d.(AB) S(between runs): 0.55 Sw(within run): 0.45 S/Sw: 1.24

The calibration is accepted if the calibration control values obtained lie within the ranges:

47.76 - 56.24 for A+B
33.82 - 40.18 for A-B

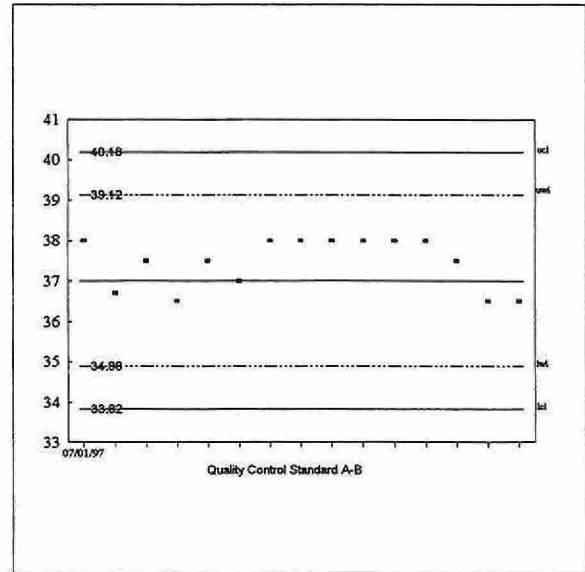
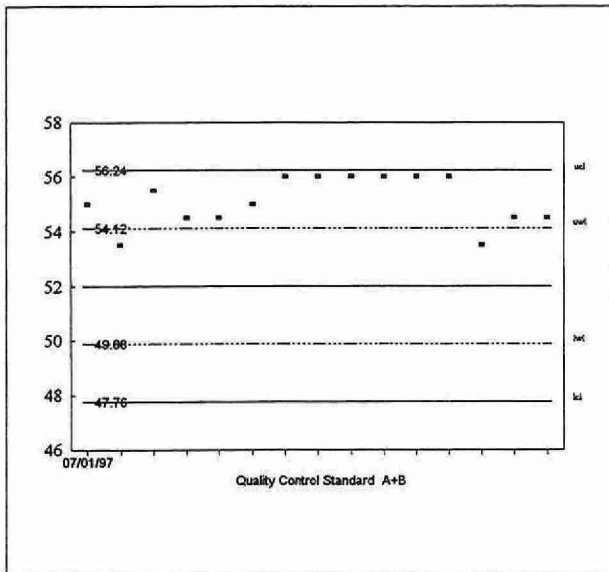
DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
12	0.0 - 20.0	0.0000	2.8
16	20.1 - 50.0	0.4700	1.4
0	50.1 - 100.0	N.A.	N.A.
28	Overall	0.4193	

OTHER CHECKS:

	n	Mean	Standard Deviation (1)
Long Term Blank	15	1.2267	0.3081

Conductivity (uS/cm)
Quality Control Data from 07/01/97 to 23/12/97
E3177A



CONDUCTIVITY

IDENTIFICATION:

Laboratory	Water Chemistry	Method Introduced:	01/04/74
Method Reference No:	E3218A	Reporting Units:	$\mu\text{S/cm}$ at 25°C
LIMS Product Code:	PHALCO3218, CONDPH3218	Supervisor:	J. McBride
Sample Type/Matrix:	Raw Sewage, Drinking Water, Effluent		

SAMPLING:

Quantity Required:	25 mL
Container:	Glass or plastic

ANALYTICAL PROCEDURE:

After equilibration at 25°C, the conductivity of the sample is measured. pH, and total fixed endpoint alkalinity are determined simultaneously.

INSTRUMENTATION:

Automated modular continual flow conductivity system comprising of a sampler, water bath, pump, conductivity meter with cell plus microcomputer control and data processing software.

REPORTING:

Maximum Significant Figures: 3	Current W value: 1	Current T value: 5
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CONTROLS:

Calibration:	LTBL plus 3 standards, e.g. QCA
Drift:	In run standards throughout the run (tap water diluted to 50% V/V)

CONDUCTIVITY (E3218A)

QUALITY CONTROL DATA FROM 09/01/97 TO 22/12/97

Analytical Range: to 2000 $\mu\text{S}/\text{cm}$

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	55	1413.0	1413.6	0.6	7.2937
B:	55	717.8	716.7	-1.1	2.1506
C:	55	717.8	716.7	-1.1	2.1506
D:	55	147.0	150.9	3.9	0.8177
A+B:	55	2130.8	2130.3	-0.5	8.5701
A-B:	55	695.2	696.9	1.7	6.4962
C+D:	55	864.8	867.6	2.8	2.3781
C-D:	55	570.8	565.8	-5.0	2.2202

s.d.(AB) S(between runs): 5.38 Sw(within run): 4.59 S/Sw: 1.2

s.d.(CD) S(between runs): 1.63 Sw(within run): 1.57 S/Sw: 1.0

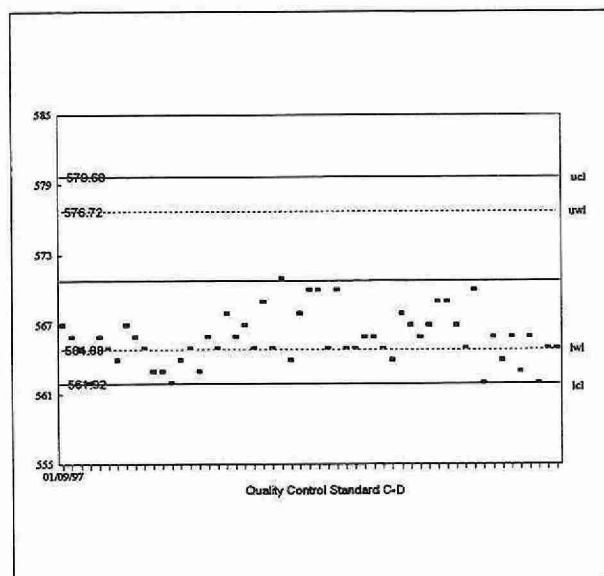
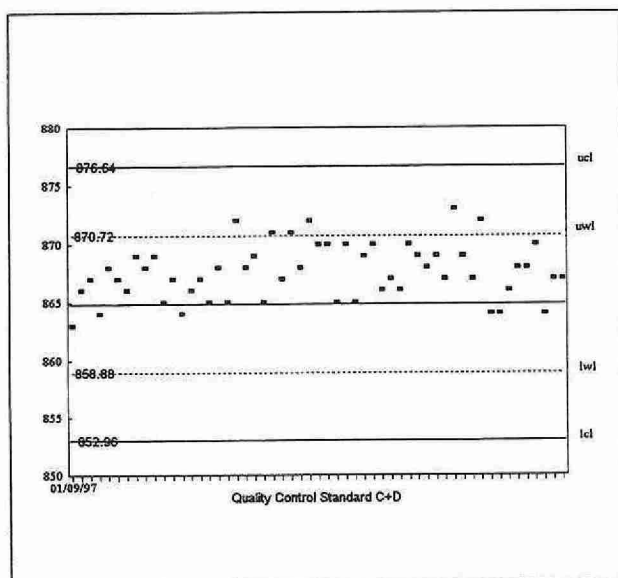
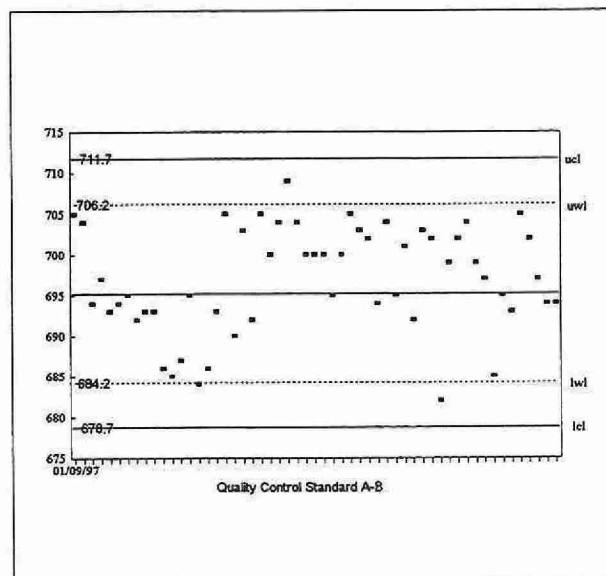
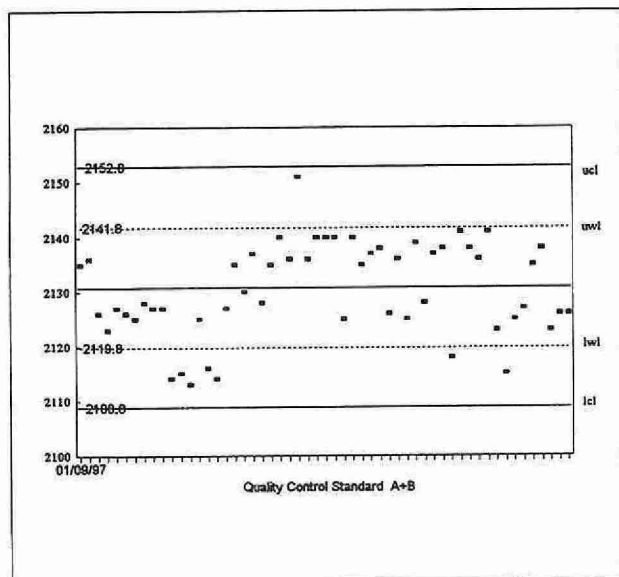
On any given day the calibration is accepted if the calibration control values obtained lie within the ranges:

2108.8	-	2152.8	for	A+B
678.7	-	711.7	for	A-B
852.96	-	876.64	for	C+D
561.92	-	579.68	for	C-D

DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
41	0 - 400	1.2299	0.5
52	401 - 1000	2.0959	0.3
37	1001 - 2000	3.7422	0.4
18	2001 - 10000	7.0711	0.2
148	Overall	2.1359	

Conductivity (uS/cm)
Quality Control Data from 09/01/97 to 22/12/97
E3218A



CONDUCTIVITY

IDENTIFICATION:

Laboratory	Water Chemistry	Method Introduced	01/04/74
Method Reference No.	E3289A	Reporting Unit	$\mu\text{S}/\text{cm}$ at 25°C
LIMS Product Code	PHALCO3289, CONDPH3289	Supervisor	J. McBride
Sample Type/Matrix	Precipitation, Surface Water		

SAMPLING:

Quantity Required	25 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

After equilibration at 25°C, the conductivity of the sample is measured. pH, and total fixed endpoint alkalinity are determined simultaneously.

INSTRUMENTATION:

Automated modular continual flow conductivity system comprising of a sampler, water bath, pump, conductivity meter with cell plus microcomputer control and data processing software.

REPORTING:

Maximum Significant Figures: 3	Current W value: 1	Current T value: 5
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CONTROLS:

Calibration	BL plus 3 standards, e.g. QCA
Drift	In run standards throughout the run (tap water diluted to 20% V/V)

CONDUCTIVITY (E3289A)

QUALITY CONTROL DATA FROM 08/01/97 TO 18/12/97

Analytical Range: to 2000 $\mu\text{S}/\text{cm}$

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	56	717.8	717.4	-0.4	2.8508
B:	56	147.0	147.6	0.6	0.8113
C:	56	147.0	147.6	0.6	0.8113
D:	56	37.1	38.8	1.7	0.3821
A+B:	56	864.8	865.0	0.2	3.1024
A-B:	56	570.8	569.7	-1.1	2.8189
C+D:	56	184.1	186.5	2.4	0.8104
C-D:	56	109.9	108.8	-1.1	0.9755

s.d.(AB) S(between runs): 2.10 Sw(within run): 1.99 S/Sw: 1.1

s.d.(CD) S(between runs): 0.63 Sw(within run): 0.69 S/Sw: 0.9

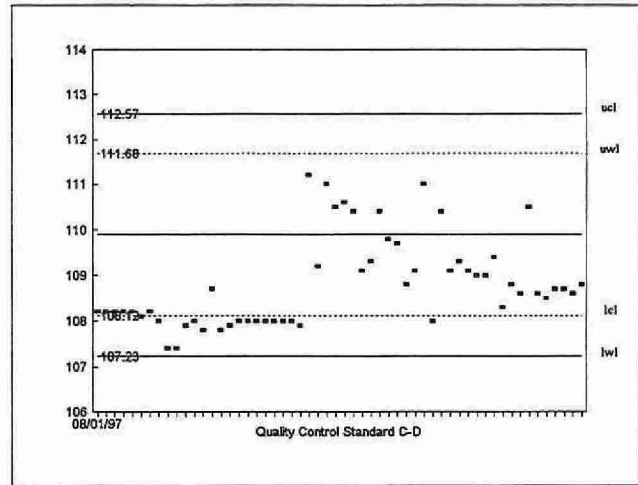
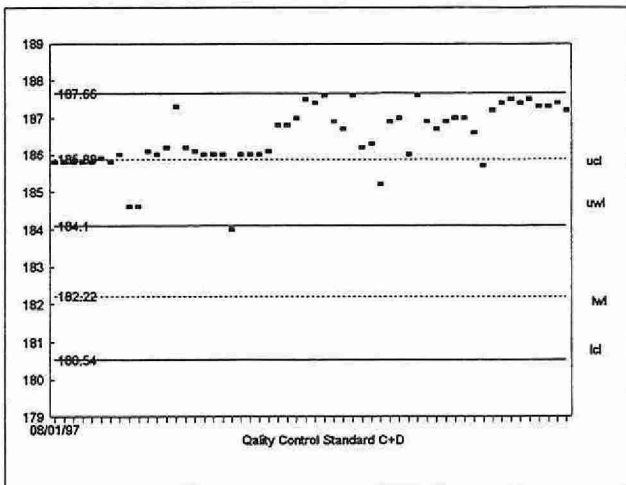
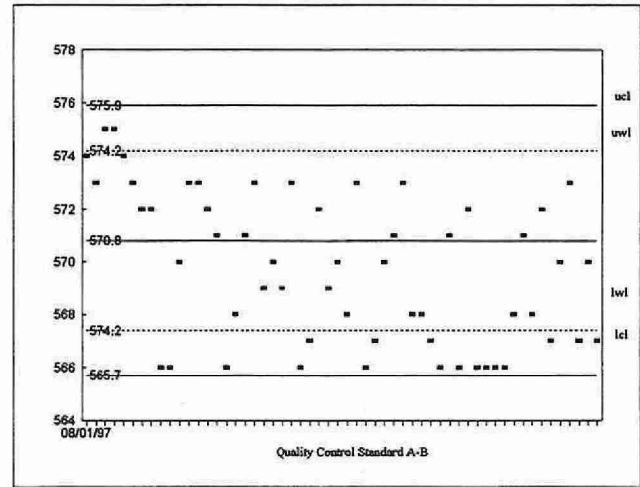
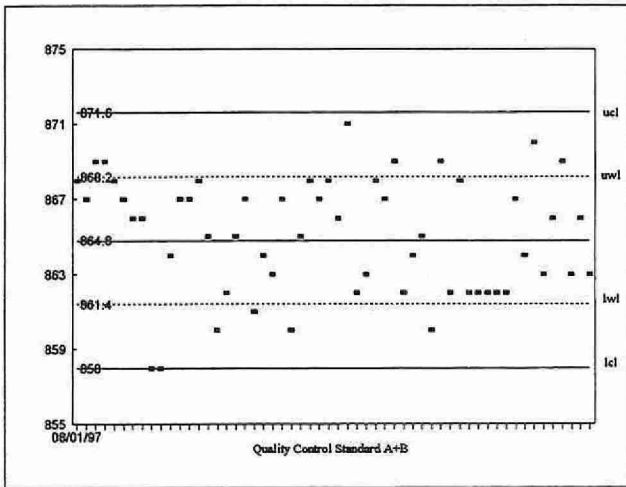
On any given day the calibration is accepted if the calibration control values obtained lie within the ranges:

858	-	871.6	for	A+B
565.7	-	575.9	for	A-B
180.54	-	187.66	for	C+D
107.23	-	112.57	for	C-D

DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
94	0 - 400	2.6860	1.1
57	401 - 1000	4.1337	0.7
7	1001 - 2000	9.3082	0.6
3	2001 - 10000	8.1650	0.3
161	Overall	2.3616	

Conductivity (uS/cm)
Quality Control Data from 08/01/97 to 18/12/97
E3289A



CYANIDE, TOTAL

IDENTIFICATION:

Laboratory	Water Chemistry	Method Introduced	01/09/88
Method Reference No.	E3015A	Reporting Unit	mg/L as CN ⁻
LIMS Product Code	CN3015	Supervisor	J. McBride
Sample Type/Matrix	Sediment, Soil, Effluent, Industrial Waste, Process Water, Raw Sewage, Vegetation, Drinking Water, Ground Water, Leachate		

SAMPLING:

Quantity Required:	350 mL
Container:	Glass or plastic

ANALYTICAL PROCEDURE:

Prescreen is conducted on all samples requiring Total Cyanide through the automated distillation procedure. Total Cyanides, including free, simple and complex cyanides are distilled out of a tartaric acid reflux/distillation as HCN and trapped in an alkaline solution. Cyanide is determined colourimetrically by the reaction of cyanide with chloramine-T to form cyanogen chloride which reacts with a combination of barbituric acid and isonicotinic acid to form a highly coloured coupling product which is measured at 600 nm.

INSTRUMENTATION:

Distillation bath.

Basic automated modular continuous flow system with colourimetric measurement through a 5 cm light path at 600 nm.

Data capture, reduction, and processing via a multistage microcomputer system.

REPORTING:

Maximum Significant Figures: 2 or the nearest W	Current W value: 0.001	Current T value: 0.005
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CALIBRATION:

BL plus 5 standards

CONTROLS:

Calibration:	2 standards, e.g. QCA
Drift:	BL and check standards

NOTES:

June 23, 1997 Skalar instrument with u.v. digester replaced Technicon colourimeter with distillation bath. See the following page for more description details.

CYANIDE, TOTAL (E3015A)

QUALITY CONTROL DATA FROM 23/01/97 TO 19/06/97

Full Scale: to 0.2 mg/L as CN

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	16	0.15	0.1486	-0.0014	0.0026
B:	16	0.02	0.0191	-0.0009	0.0013
A+B:	16	0.17	0.1677	-0.0023	0.0037
A-B:	16	0.13	0.1295	-0.0005	0.0018

s.d.(AB) S(between runs): 0.0021 Sw(within run): 0.0013 S/Sw: 1.6

The calibration is accepted if the calibration control values obtained lie within the ranges:

0.143 - 0.197 for A+B
0.111 - 0.149 for A-B

REFERENCE MATERIAL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
KCN:	18	0.10	0.1024	0.0024	0.0015
FeCN:	18	0.10	0.1012	0.0011	0.0024

DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
23	0 - 0.020	0.0002	6.3
5	0.021 - 0.040	0.0005	1.9
3	0.041 - 0.100	0.0013	2.2
6	0.101 - 0.200	0.0028	1.7
37	Overall	0.0012	

CYANIDE, TOTAL (E3015B)

QUALITY CONTROL DATA FROM 23/06/97 TO 16/12/97

Full Scale: to 0.2 mg/L as CN

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	20	0.15	0.149	-0.001	0.0015
B:	20	0.02	0.019	-0.001	0.0007
A+B:	20	0.17	0.168	-0.002	0.0016
A-B:	20	0.13	0.130	0.000	0.0018

s.d.(AB) S(between runs): 0.0000015 Sw(within run): 0.0000016 S/Sw: 0.91

The calibration is accepted if the calibration control values obtained lie within the ranges:

0.162 - 0.178 for A+B

0.124 - 0.136 for A-B

REFERENCE MATERIAL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
KCN:	18	0.10	0.1013	0.0013	0.0013
FeCN:	18	0.10	0.0993	-0.0007	0.0018

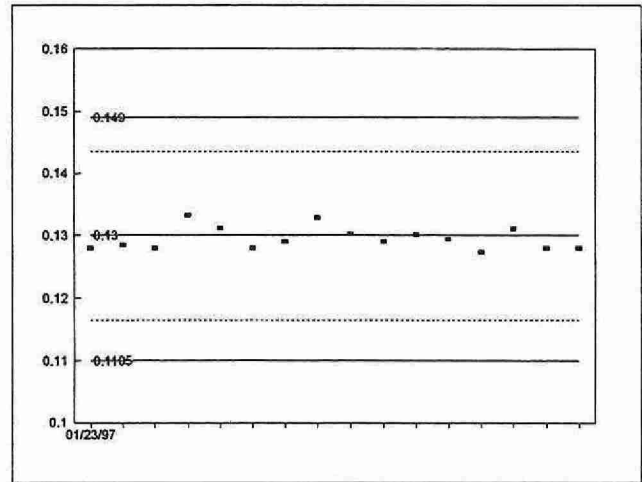
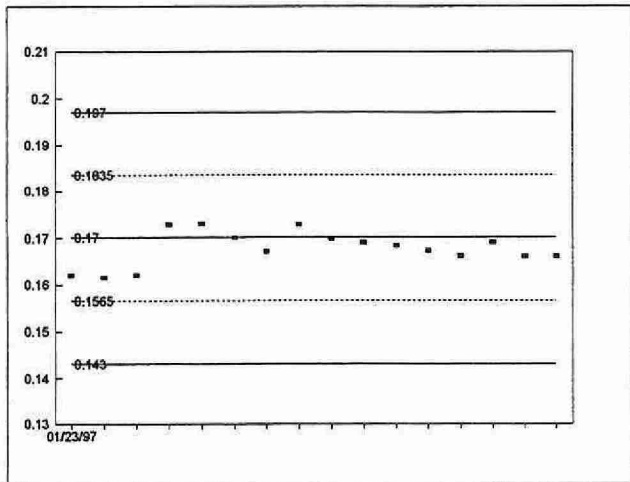
DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
30	0 - 0.020	0.0007	21.5
1	0.021 - 0.040	N.A.	N.A.
3	0.041 - 0.100	0.0026	5.3
2	0.101 - 0.200	N.A.	N.A.
35	Overall	0.0011	

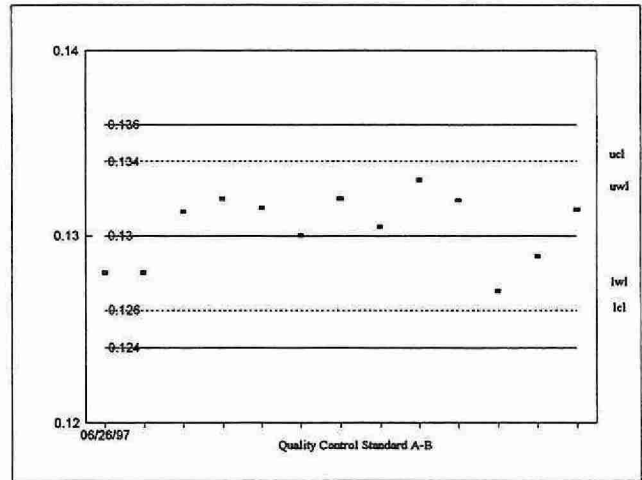
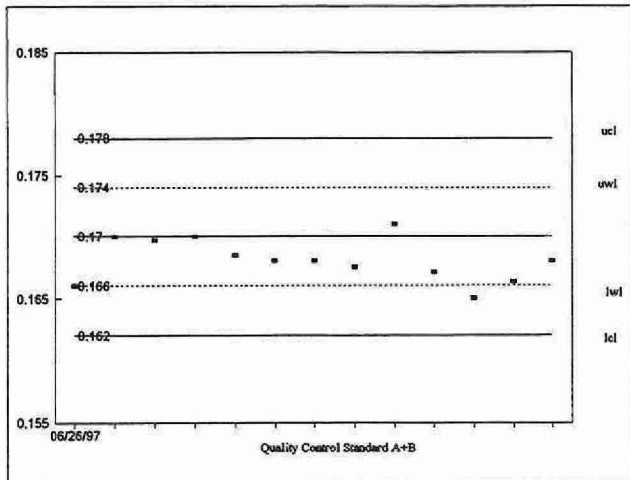
OTHER CHECKS:

	n	Mean Concentration	Standard Deviation (1)
Long Term Blank	14	0.0010	0.0004

Cyanide , Total (mg/L as CN)
Quality Control Data From 23/01/97 to 19/06/97
E3015A



Cyanide , Total (mg/L as CN)
Quality Control Data From 23/06/97 to 16/12/97
E3015B



FLUORIDE

IDENTIFICATION:

Laboratory	Water Chemistry	Method Introduced	before '74
Method Reference No	E3369A	Reporting Unit	mg/L as F
LIMS Product Code	FNOT3369	Supervisor	J. McBride
Sample Type/Matrix	Effluent, Industrial Waste, Process Water, Drinking Water, Ground Water, Leachate, Surface Water		

SAMPLING:

Quantity Required	50 mL
Container	Plastic

ANALYTICAL PROCEDURE:

Using an automated flow system the sample is distilled in the presence of sulphuric acid at 160°C; the distillate is then reacted (in an acetic acid-acetate buffer media) with Alizarin Fluorine Blue and lanthanum nitrate to form a ternary Alizarin Blue-lanthanide-fluoride complex.

Approximate absorbance: 0.8 at the full scale level.

INSTRUMENTATION:

Modular continuous flow colourimetric system plus a distillation module. Colourimetric measurement is through a 5.0 cm. light path at 630 nm. Data capture, reduction, and processing via a multi-stage microcomputer system.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.01	Current T value: 0.05
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CALIBRATION:

BL plus 6 standards

CONTROLS:

Calibration	LTB plus 3 standards, e.g. QCA
Drift	BL every 10 samples; standard every 20 samples

FLUORIDE (E3369A)

QUALITY CONTROL DATA FROM 02/01/97 TO 29/12/97

Full Scale: to 2.0 mg/L as F

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	48	1.6	1.607	0.007	0.0213
B:	48	0.8	0.799	-0.001	0.0140
C:	48	0.16	0.161	0.001	0.0082
A+B:	48	2.4	2.406	0.006	0.0291
A-B:	48	0.8	0.807	0.007	0.0215
B+C:	48	0.96	0.961	0.001	0.0169
B-C:	48	0.64	0.638	-0.002	0.0157

s.d.(AB) S(between runs): 0.0181 Sw(within run): 0.0152 S/Sw: 1.2
s.d.(BC) S(between runs): 0.0115 Sw(within run): 0.0111 S/Sw: 1.0

The calibration is accepted if the calibration control values obtained lie within the ranges:

2.302 - 2.498 for A+B
0.726 - 0.874 for A-B
0.91 - 1.01 for B+C
0.59 - 0.69 for B-C

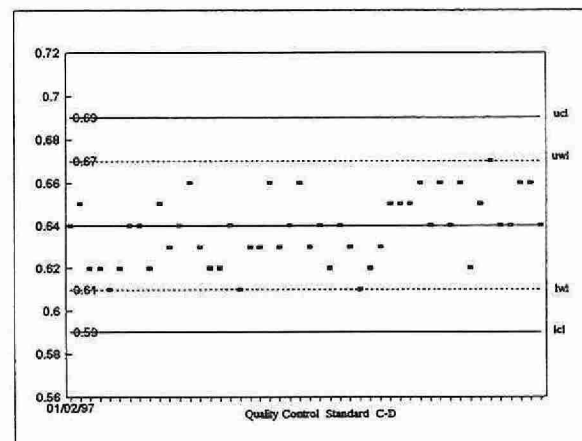
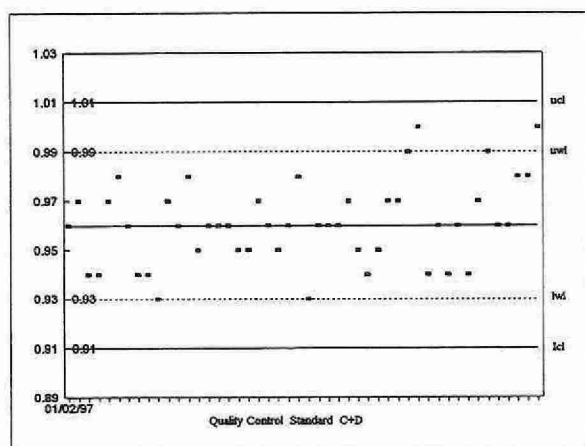
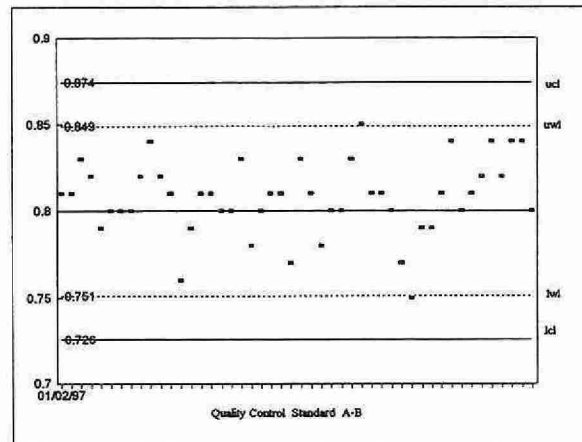
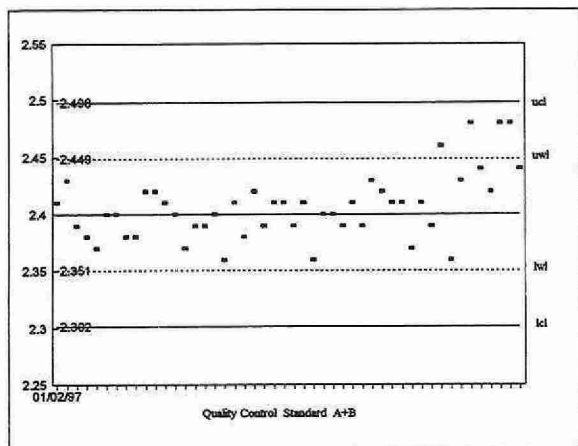
DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
90	0.00 - 0.20	0.0146	15.6
8	0.21 - 0.40	0.0115	4.2
25	0.41 - 1.00	0.0160	2.1
19	1.01 - 2.00	0.0265	2.0
142	Overall	0.0168	

OTHER CHECKS:

	n	Mean	Standard Deviation (1)
Long Term Blank	48	-0.00042	0.0109

Fluoride (mg/L as F)
Quality Control Data From 02/01/97 To 29/12/97
E3369A



IRON, TOTAL

IDENTIFICATION:

Laboratory	Dorset	Method Introduced	20/07/88
Method Reference No.	E3303B	Reporting Unit	µg/L as Fe
LIMS Product Code	FEMN3303, FE3303	Supervisor	F. Tomassini
Sample Type/Matrix	Surface Water, Precipitation, Leachate		

SAMPLING:

Quantity Required	25 mL
Container	Glass or plastic, capped, acidified to 0.25% with HNO ₃

ANALYTICAL PROCEDURE:

An undigested sample is introduced to an in-line UV digester. A reducing agent and a buffer are added to the sample. TPTZ is added to develop a blue colour, the intensity of which is proportional to the concentration of Fe in the sample. The colour is measured at 600nm.

INSTRUMENTATION:

- An AAII autoanalyzer with colorimeter and automated sampler.

REPORTING:

Maximum Significant Figures: 3	Current W value: 2	Current T value: 10
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CALIBRATION:

BL plus 4 standards

CONTROLS:

Calibration	Long Term blank, 3 QC's, 4 duplicates
Drift	Blank plus 1 standard every 10 samples.

IRON, TOTAL (E3303B)

QUALITY CONTROL DATA FROM 08/01/97 TO 29/12/97

Full Scale: to 1000.0 µg/L as Fe

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	34	750.0	753.6	3.6	4.5486
B:	34	250.0	252.2	2.2	3.3524
C:	34	50.0	49.7	-0.3	2.2236
A+B:	34	1000.0	1004	4	7.0218
A-B:	34	500.0	501.4	1.4	4.5127
B+C:	34	300.0	300.6	0.6	5.1841
B-C:	34	200.0	202.5	2.5	3.3627

s.d.(AB) S(between runs): 4.0

Sw(within run): 3.19

S/Sw: 1.25

s.d.(BC) S(between runs): 2.8

Sw(within run): 2.38

S/Sw: 1.20

The calibration is accepted if the calibration control values obtained lie within the ranges:

972	-	1028	for	A+B
482	-	518	for	A-B
279	-	321	for	B+C
186	-	214	for	B-C

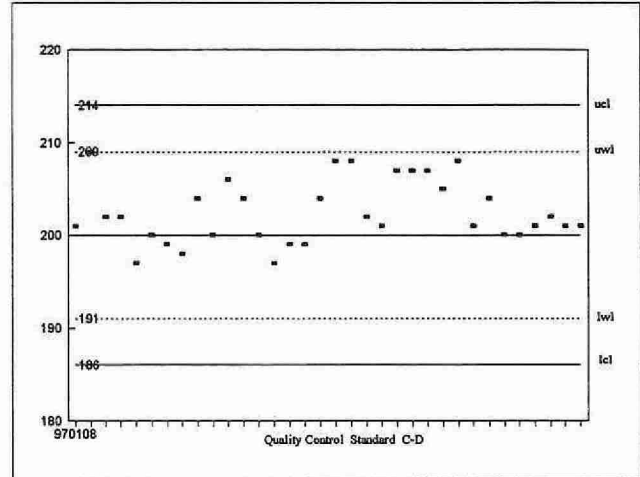
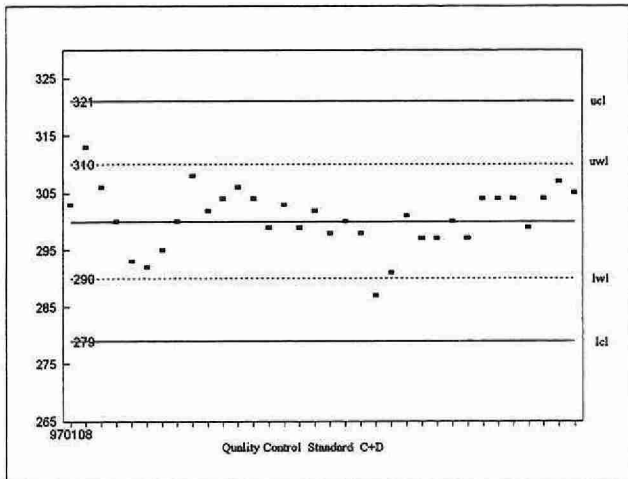
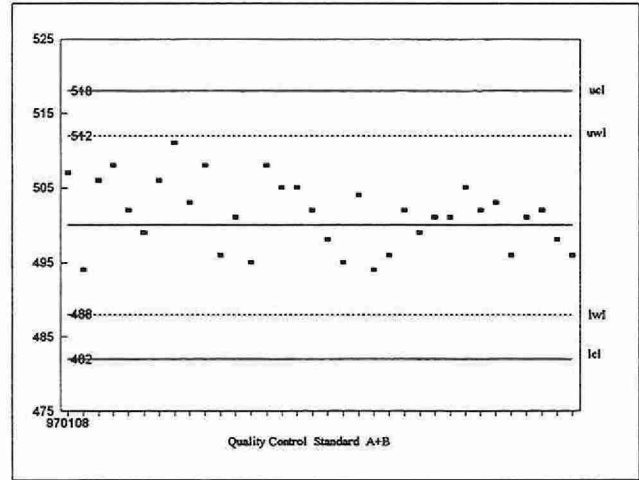
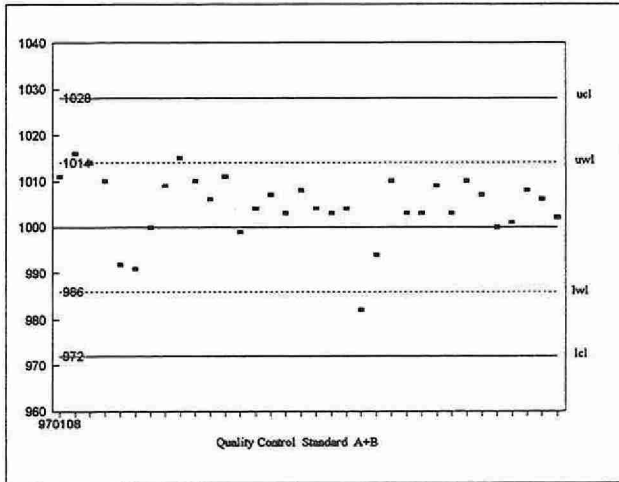
DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
53	0 - 100	1.3067	3.7
25	101 - 200	3.1095	2.3
36	201 - 500	2.4312	0.9
194	501 - 1000	5.1599	0.6
128	Overall	2.3392	

OTHER CHECKS:

	n	Mean	Standard Deviation (1)
Long Term Blank	34	0.6765	1.4291

Iron, Total (ug/L as Fe)
Quality Control Data From 08/01/97 To 29/12/97
E3303B



MAGNESIUM

IDENTIFICATION:

Laboratory	Dorset	Method Introduced	20/07/88
Method Reference No.	E3249A	Reporting Unit	mg/L as Mg
LIMS Product Code	CAT3249	Supervisor	F. Tomassini
Sample Type/Matrix	Leachate, Precipitation, Surface Water		

SAMPLING:

Quantity Required	5 mL
Container	Plastic

ANALYTICAL PROCEDURE:

Samples are analyzed by AAS at 285.2 nm with an air-acetylene flame. Lanthanum chloride is added as a releasing agent via an automated sampling train.

Approximate absorbance: 0.5 at the full scale level.

INSTRUMENTATION:

Automated modular atomic absorption spectrophotometer (AAS) system.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.005	Current T value: 0.025
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CALIBRATION:

BL plus 5 standards

CONTROLS:

Calibration	LTBL plus 3 standards, e.g., QCA
Drift	BL, reslope standard every 10 samples.

NOTES:

The control standards are corrected for the LTB from which they were made.

MAGNESIUM (E3249A)

QUALITY CONTROL DATA FROM 14/01/97 TO 23/12/97

Full Scale: to 2.0 mg/L as Mg

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	42	1.6	1.601	0.001	0.0075
B:	42	0.4	0.399	-0.001	0.0026
C:	42	0.1	0.104	0.004	0.0013
A+B:	42	2.0	1.999	-0.001	0.0086
A-B:	42	1.2	1.202	0.002	0.0080
B+C:	42	0.5	0.502	0.002	0.0064
B-C:	42	0.3	0.295	-0.005	0.0024

s.d.(AB)

S(between runs): 0.006

Sw(within run): 0.006

S/Sw: 0.99

s.d.(BC)

S(between runs): 0.0021

Sw(within run): 0.0017

S/Sw: 1.23

The calibration is accepted if the calibration control values obtained lie within the ranges:

1.96	-	2.04	for	A+B
1.17	-	1.23	for	A-B
0.483	-	0.517	for	B+C
0.287	-	0.313	for	B-C

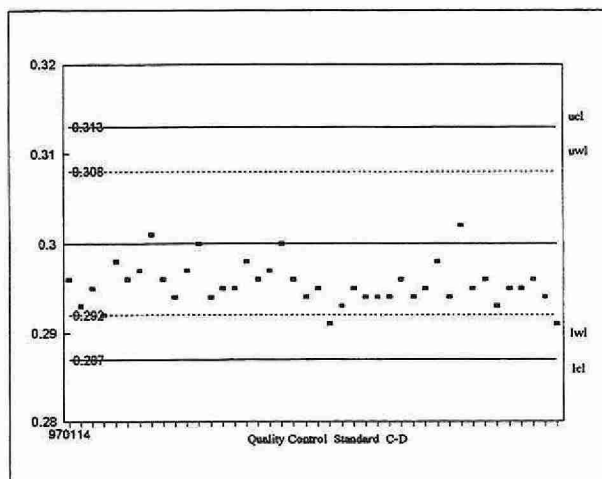
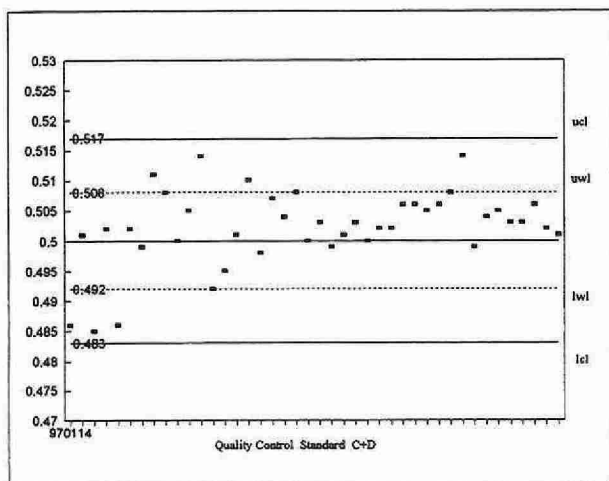
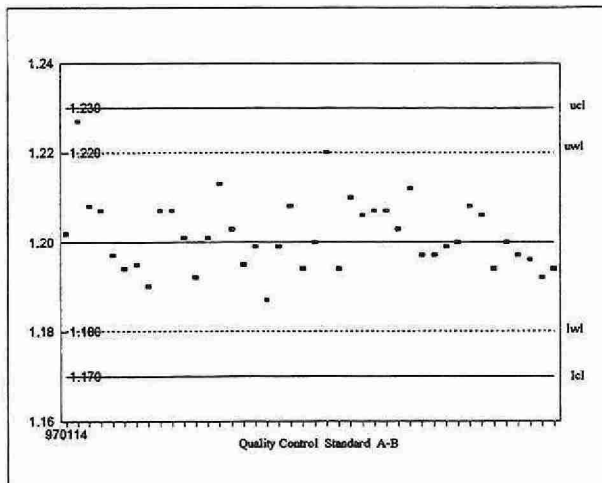
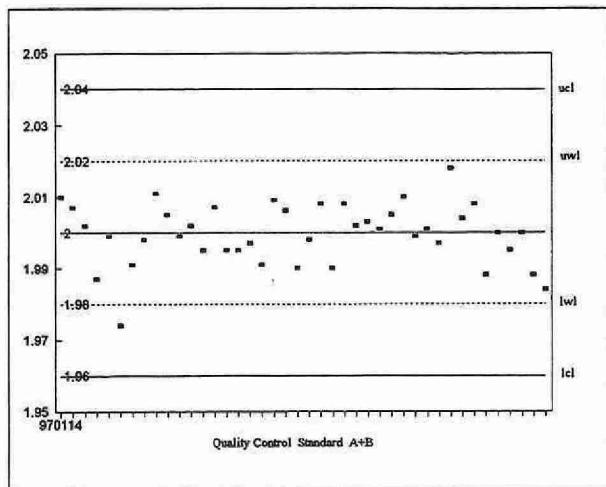
DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
38	0.00 - 0.20	0.0009	1.7
20	0.21 - 0.40	0.0025	1.0
76	0.41 - 1.00	0.0057	1.5
15	1.01 - 2.00	0.0100	0.7
149	Overall	0.0047	

OTHER CHECKS:

	n	Mean	Standard Deviation (1)
Long Term Blank	42	0.0006	0.0027

Magnesium (mg/L as Mg)
Quality Control Data From 14/01/97 To 23/12/97
E3249A



MANGANESE, TOTAL**IDENTIFICATION:**

Laboratory	Dorset	Method Introduced	1991
Method Reference No.	E3303B	Reporting Unit	$\mu\text{g/L}$ as Mn
LIMS Product Code	FEMN3303	Supervisor	J. McBride
Sample Type/Matrix	Surface Water, Precipitation, Leachate		

SAMPLING:

Quantity Required	25 mL
Container	Glass or plastic, capped, acidified to 0.25% with HNO_3

ANALYTICAL PROCEDURE:

An undigested sample is introduced to an in-line UV digester. A reducing agent and an ammonium buffer are added to the sample. Formaldoxime complexes with Mn to develop a colour the intensity of which is proportional to the concentration of Mn in the sample. EDTA is then added to complex interferences. The color is read at 480nm. A reference channel is used to counter the effects of residual natural colour in the sample. In the reference channel the EDTA is added prior to the addition of colour reagent.

INSTRUMENTATION:

- An AAI autoanalyzer with colorimeter and automated sampler.

REPORTING:

Maximum Significant Figures: 3	Current W value: 1	Current T value: 5
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CALIBRATION:

BL plus 4 standards

CONTROLS:

Calibration	Long Term blank, 3 QC's, 4 duplicates
Drift	Blank plus 1 standard every 10 samples.

MANGANESE, TOTAL (E3303B)

QUALITY CONTROL DATA FROM 08/01/97 TO 30/12/97

Full Scale: to 200.0 µg/L as Mn

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	34	150.0	149.6	-0.4	1.4310
B:	34	50.0	48.7	-1.3	1.0737
C:	34	10.0	9.05	-0.95	0.5886
A+B:	34	200.0	198.9	-1.1	1.8420
A-B:	34	100.0	100.8	0.8	1.6155
B+C:	34	60.0	58.4	-1.6	1.3883
B-C:	34	40.0	39.7	-0.3	0.9578

s.d.(AB) S(between runs): 1.26
s.d.(BC) S(between runs): 0.87

Sw(within run): 1.14
Sw(within run): 0.68

S/Sw: 1.1
S/Sw: 1.3

The calibration is accepted if the calibration control values obtained lie within the ranges:

192.6 - 207.4 for A+B
93.5 - 106.5 for A-B
54.4 - 65.6 for B+C
36.2 - 43.8 for B-C

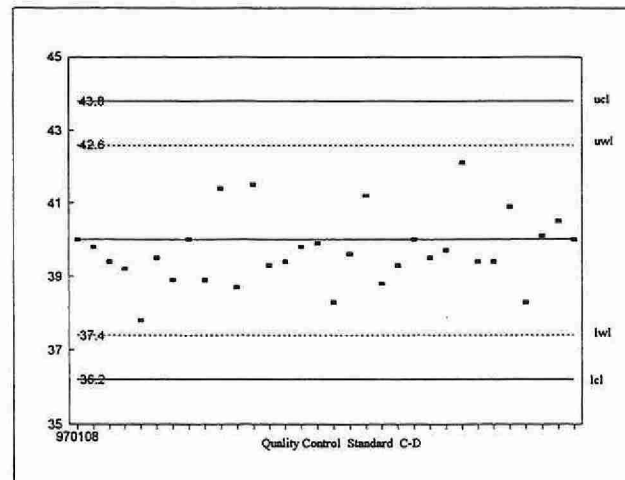
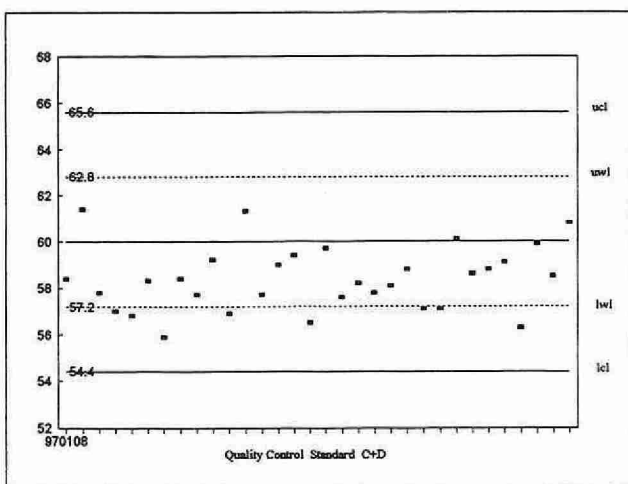
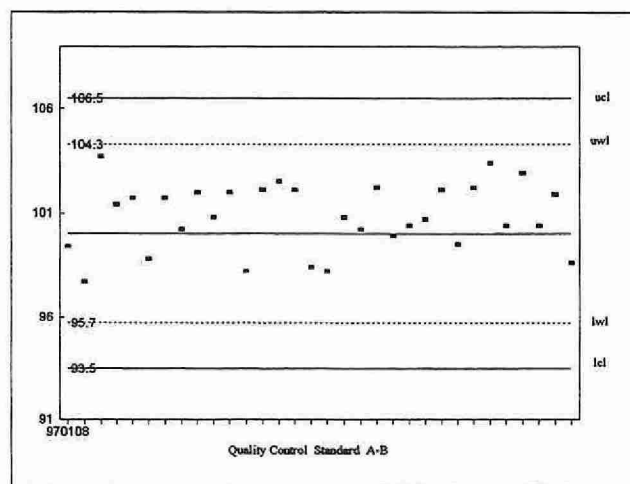
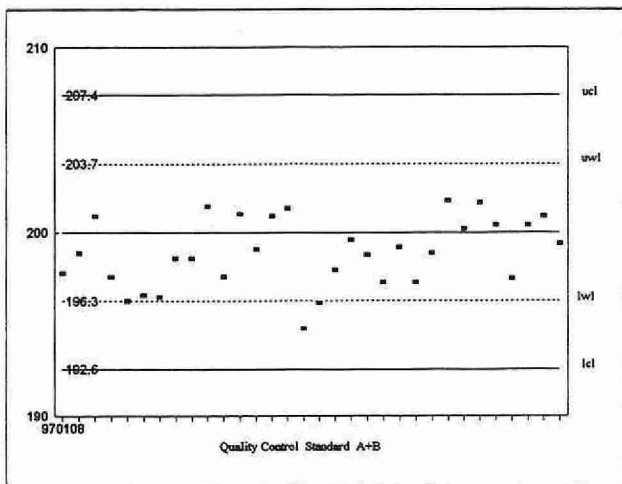
DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
39	0.0 - 20.0	0.5904	12.8
38	20.1 - 40.0	0.7741	5.1
35	40.1 - 100.0	0.8945	1.8
8	100.1 - 200.0	2.0603	1.4
120	Overall	0.8223	

OTHER CHECKS:

	n	Mean	Standard Deviation (1)
Long Term Blank	34	-0.2875	0.3377

Manganese, Total (ug/L as Mn)
Quality Control Data From 08/01/97 To 29/12/97
E3303B



NITRATE

IDENTIFICATION:

Laboratory	Water Chemistry	Method Introduced	01/04/78
Method Reference No.	E3004A	Units	$\mu\text{g}/\text{m}^3$ as NO_3
LIMS Product Code	ANION3004	Supervisor	J. McBride
Sample Type/Matrix	Air; HiVol Glass Fibre, Quartz and Polyflon, Other Filters and Puff		

SAMPLING:

Quantity Required	3/4" or 1.9cm strip from 8"x10" filter
Container	50 mL polypropylene tube

SAMPLING PREPARATION:

A 3/4" strip is cut in pieces and deposited into a 50 mL polypropylene tube. 50 mL of Pure-Water is added to the tube. The tube is placed on a horizontal shaker for approximately 1 hour. The supernatant is then filtered into a 15 mL plastic tube and analysed.

ANALYTICAL PROCEDURE:

Nitrate separated from other anions in the sample by automated suppressed ion chromatography using an eluent mixture of sodium bicarbonate and sodium carbonate and a conductivity detector. The concentration of nitrate (mg/L) is determined by the comparison of the analyte peak area count to that of a series of standards. The analyte result is corrected for the filter blank before the final calculation is made. The result is reported as $\mu\text{g}/\text{m}^3$ as NO_3 . Chloride and sulphate are determined simultaneously.

INSTRUMENTATION:

Horizontal Shaker, ion chromatographic system plus a PC with ChromPerfect software and DT2804 card for automated sample injection, timing, and data processing.

REPORTING:

Maximum Significant Figures: 2	Current W value: $0.1 \mu\text{g}/\text{m}^3$	Current T value: $0.5 \mu\text{g}/\text{m}^3$
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CALIBRATION:

6 standards

CONTROLS:

Calibration	MB, IS(n), CS1, and CS2
Drift	Duplicate plus 2 standard approximately every 20 samples

NITRATE cont'd

NOTES:

Duplicate criterion is based on duplicate analysis of the same filter because duplicate filters are not received. To convert unit from mg/L to $\mu\text{g}/\text{m}^3$, the final concentration of NO_3 in mg/L is multiplied by the following formula:

$$\text{Result}(\text{mg/L}) \times 50\text{mL} \times (63/6.75) / \text{air volume} = \mu\text{g}/\text{m}^3$$

Where: 63 is the area of the filter exposed and 6.75 is the sample aliquot are (in^2)

NITRATE (E3004A)

QUALITY CONTROL DATA FROM 01/01/97 TO 24/12/97

Analytical Range: to 50 mg/L as NO₃

DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
75	0.00 - 10.0	0.0906	9.5
31	10.1 - 25.0	0.5123	5.7
2	25.1 - 50.0	N.A.	N.A.
108	Overall	0.1650	

NITROGEN, AMMONIA PLUS AMMONIUM

IDENTIFICATION:

Laboratory	Water Chemistry	Method Introduced	01/04/78
Method Reference No.	E3364A	Reporting Unit	mg/L as N
LIMS Product Code	DISNUT3364	Supervisor	J. McBride
Sample Type/Matrix	Dried Sludge, Sediment, Soil, Vegetation, Drinking Water, Ground Water, Surface Water		

SAMPLING:

Quantity Required	10 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

Ammonia plus ammonium ions are determined on the supernatant of a settled sample via the formation of indophenol blue in a buffered system using nitroprusside as a catalyst. A reference stream, which differs from the colour formation stream by replacement of the catalyst with an equal flow of water, is employed to suppress sample matrix effects.

Approximate absorbance: 0.5 at the full scale level.

Nitrate plus nitrite, nitrite, and reactive orthophosphate are determined simultaneously.

INSTRUMENTATION:

Basic automated modular continuous flow system plus the following modules: 2 of 37°C heating bath (7.7 mL delay). Colourimetric measurement is through a 1.5 cm. light path at 630 nm.

Data capture, reduction, and processing via a multi-stage microcomputer system.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.002	Current T value: 0.01
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CALIBRATION:

BL plus 7 standards

CONTROLS:

Calibration	LTBL plus 3 standards, e.g. QCA
Drift	BL every 10 samples; standard every 20 samples

NITROGEN, AMMONIA PLUS AMMONIUM (E3364A)

QUALITY CONTROL DATA FROM 07/01/97 TO 23/12/97

Full Scale: to 2.00 mg/L as N

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	93	1.60	1.6003	0.0003	0.0125
B:	93	0.800	0.796	-0.004	0.0068
C:	93	0.160	0.159	-0.001	0.0094
A+B:	93	2.40	2.396	-0.004	0.0150
A-B:	93	0.800	0.804	0.004	0.0133
B+C:	93	0.960	0.955	-0.005	0.0133
B-C:	93	0.640	0.637	-0.003	0.0097

s.d.(AB) S(between runs):0.0100

Sw(within run): 0.0094

S/Sw: 1.1

s.d.(BC) S(between runs):0.0082

Sw(within run): 0.0068

S/Sw: 1.2

The calibration is accepted if the calibration control values obtained lie within the ranges:

2.353	-	2.447	for	A+B
0.765	-	0.835	for	A-B
0.931	-	0.989	for	B+C
0.618	-	0.662	for	B-C

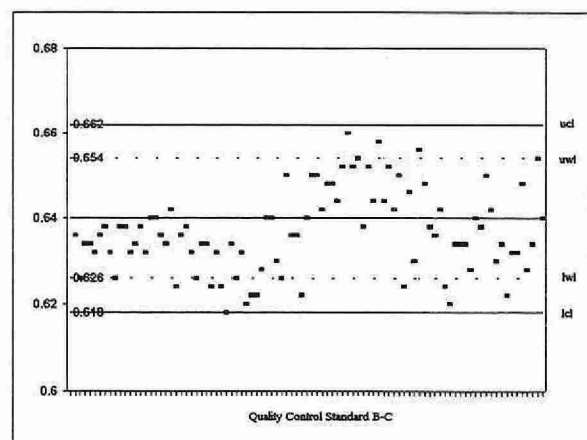
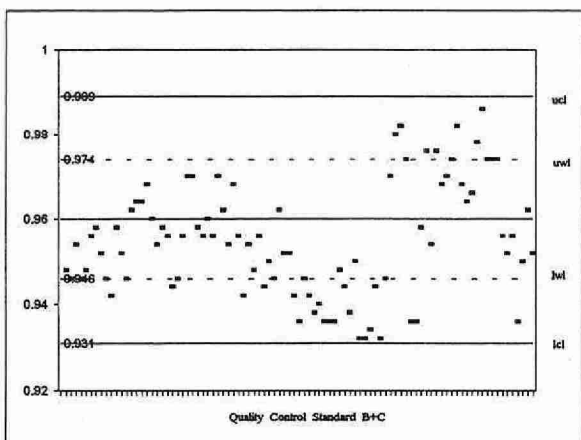
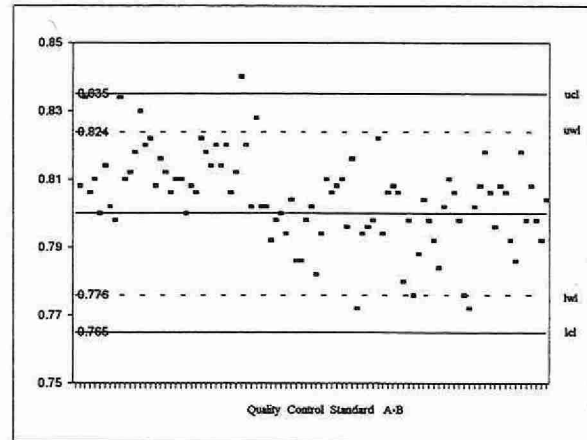
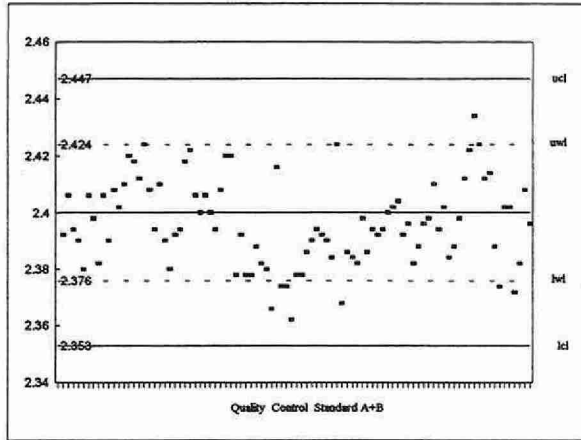
DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
228	0.000 - 0.200	0.00465	23.3
24	0.201 - 0.400	0.00844	2.9
15	0.401 - 1.00	0.0133	1.9
9	1.01 - 2.00	0.01052	2.0
276	Overall	0.00555	

OTHER CHECKS:

	n	Mean	Standard Deviation (1)
Long Term Blank	93	0.0041	0.0071

Nitrogen, Ammonia plus Ammonium (mg/l as N)
 Quality Control Data From 07/01/97 to 23/12/97
 E3364A



NITROGEN, AMMONIA PLUS AMMONIUM

IDENTIFICATION:

Laboratory	Water Chemistry	Method Introduced	01/04/77
Method Reference No.	E3366A	Reporting Unit	mg/L as N
LIMS Product Code	DISNUT3366	Supervisor	J. McBride
Sample Type/Matrix	Sludge, Effluent, Raw Sewage, Industrial Waste, Process Water, Leachate, Drinking Water, Ground Water		

SAMPLING:

Quantity Required	10 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

Ammonia plus ammonium ions are determined on the supernatant of a settled sample via the formation of indophenol blue in a buffered system using nitroprusside as a catalyst.

Approximate absorbance: 0.7 at the full scale level.

Reactive orthophosphate, nitrogen-nitrite and nitrogen-nitrate plus nitrite are determined simultaneously.

INSTRUMENTATION:

Basic automated modular continuous flow system plus one 38°C heating bath (7.7 mL delay).

Colourimetric measurement is through a 1.5 cm. light path at 630 nm. Data capture, reduction, and processing via a multi-stage microcomputer system.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.05	Current T value: 0.25
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CALIBRATION:

BL plus 7 standards

CONTROLS:

Calibration	LTBL plus 3 standards, e.g. QCA
Drift	BL every 10 samples; standard every 20 samples

NITROGEN, AMMONIA PLUS AMMONIUM (E3366A)

QUALITY CONTROL DATA FROM 10/01/97 TO 19/12/97

Full Scale: to 50.0 mg/L as N

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	82	40.0	40.123	0.123	0.3282
B:	82	20.0	20.093	0.093	0.1705
C:	82	4.00	4.010	0.010	0.0740
A+B:	82	60.0	60.216	0.216	0.4404
A-B:	82	20.0	20.030	0.030	0.2823
B+C:	82	24.0	24.103	0.103	0.2264
B-C:	82	16.0	16.082	0.082	0.1337

s.d.(AB) S(between runs): 0.26

Sw(within run): 0.20

S/Sw: 1.3

s.d.(BC) S(between runs): 0.13

Sw(within run): 0.09

S/Sw: 1.4

The calibration is accepted if the calibration control values obtained lie within the ranges:

58.76	-	61.24	for	A+B
19.07	-	20.93	for	A-B
23.34	-	24.66	for	B+C
15.50	-	16.50	for	B-C

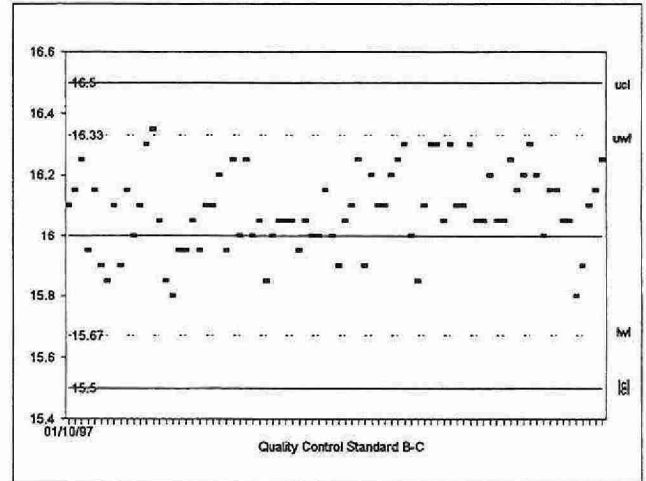
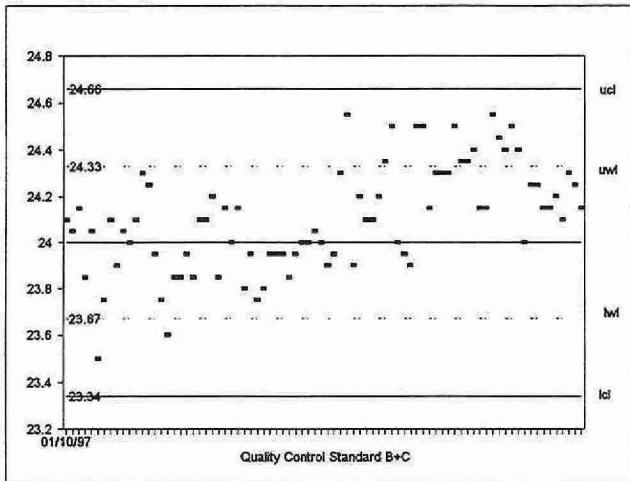
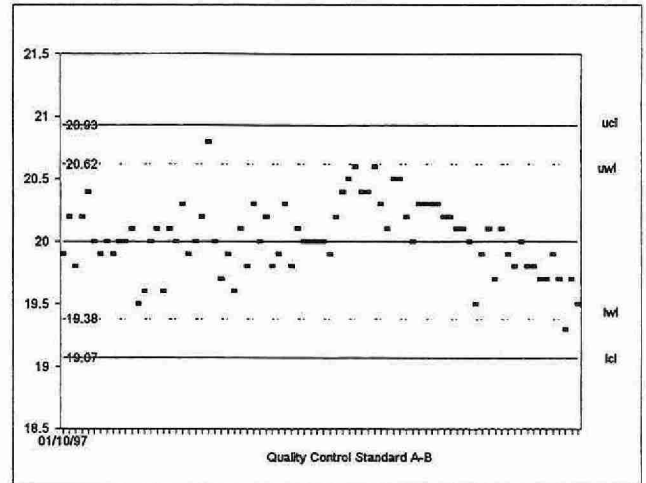
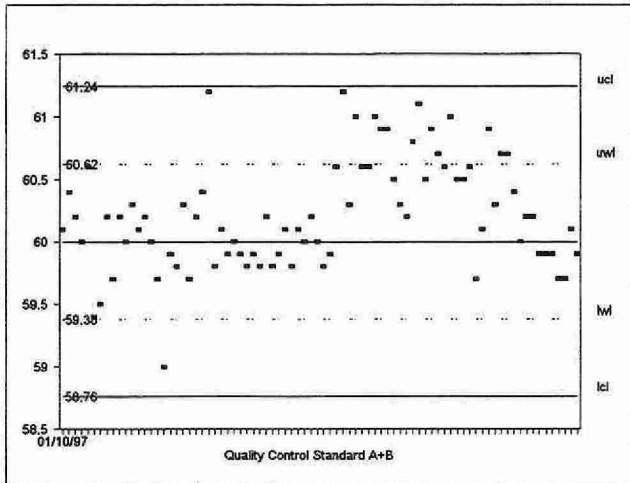
DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
176	0.00 - 5.00	0.0563	8.3
16	5.10 - 10.0	0.1383	1.7
21	10.1 - 25.0	0.2603	2.7
19	25.1 - 50.0	0.2607	0.7
232	Overall	0.0743	

OTHER CHECKS:

	n	Mean	Standard Deviation (1)
Long Term Blank	82	0.0518	0.0941

Nitrogen, Ammonia Plus Ammonium (mg/L as N)
Quality Control Data from 10/01/97 to 19/12/97
E3366A



NITROGEN, AMMONIA PLUS AMMONIUM

IDENTIFICATION:

Laboratory	Dorset	Method Introduced	01/06/76
Method Reference No.	E3374A	Reporting Unit	µg/L as N
LIMS Product Code	AMMNO3374	Supervisor	F. Tomassini
Sample Type/Matrix:	Surface Waters, Precipitation, Leachate		

SAMPLING:

Quantity Required:	50 mL
Container:	Glass or plastic

ANALYTICAL PROCEDURE:

Ammonia plus ammonium ions are determined on the sample via the formation of indophenol blue in a buffered system using nitroprusside as a catalyst. A reference stream, which differs from the colour formation stream by replacement of the catalyst with an equal flow of water, is employed to suppress sample matrix effects.

Approximate absorbance : 0.40 at the full scale level.

Nitrate plus nitrite is determined simultaneously.

INSTRUMENTATION:

Basic automated modular continuous flow system plus the following modules: 2 of 37°C heating bath (7.7 mL delay). Colourimetric measurement is through a 5.0 cm. light path at 630 nm. Two analytical ranges are obtained from the output of the colourimeter.

REPORTING:

Maximum Significant Figures: 3	Current W value: 1	Current T value: 5
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CALIBRATION:

BL plus 8 standards

CONTROLS:

Calibration	LTBL plus 3 QC standards, e.g. QCA
Drift	BL every 10 samples and BL plus check standard every 20 samples

NOTES:

JAN. 1995 LIMS replaced LIS and the method reference no. was changed from E3033A to E3374A. LIMS product code is AMMNO3374.

NITROGEN, AMMONIA PLUS AMMONIUM (E3374A)

QUALITY CONTROL DATA FROM 17/01/97 TO 22/12/97

Full Scale: to 1000 µg/L as N

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	29	600	600.9	0.9	6.8104
B:	29	200	195.9	-4.1	4.3320
C:	29	60	59.5	-0.5	3.7666
A+B:	29	800	796.8	-3.2	9.8149
A-B:	29	400	405.0	5.0	5.8279
B+C:	29	260	255.4	-4.6	6.2359
B-C:	29	140	136.3	-3.7	5.1980

s.d.(AB) S(between runs): 4.3

Sw(within run): 3.9

S/Sw: 1.1

s.d.(BC) S(between runs): 3.5

Sw(within run): 2.9

S/Sw: 1.2

The calibration is accepted if the calibration control values obtained lie within the ranges:

780	-	820	for	A+B
385	-	415	for	A-B
248	-	272	for	B+C
131	-	149	for	B-C

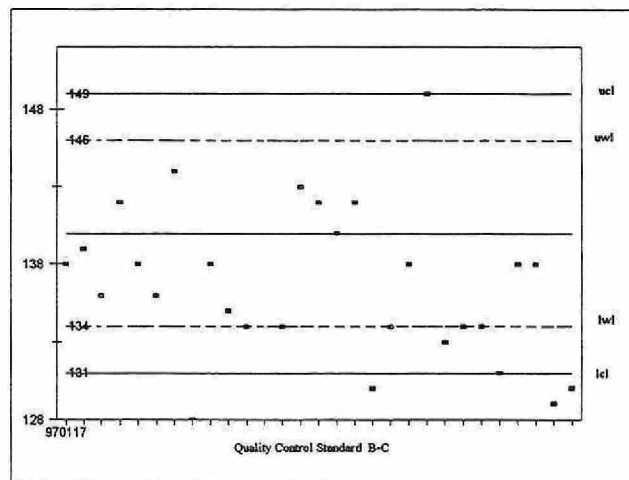
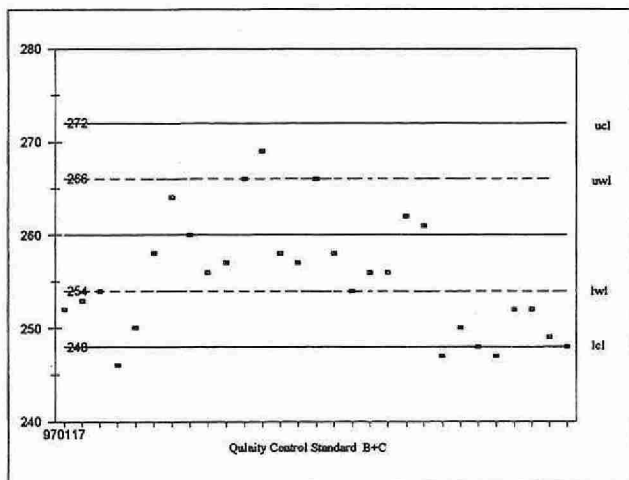
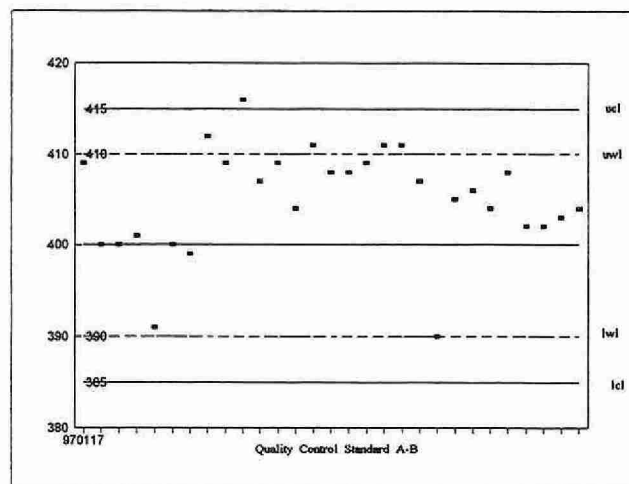
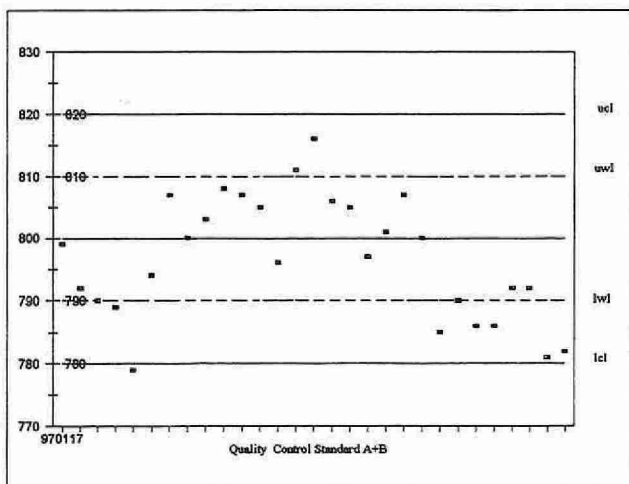
DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
60	0.0 - 100	2.9078	10.5
14	101 - 200	4.9789	3.4
9	201 - 500	4.1487	1.6
4	501 - 1000	10.2413	1.5
87	Overall	3.4359	

OTHER CHECKS:

	n	Mean	Standard Deviation (1)
Long Term Blank	29	1.7586	2.8367

Nitrogen, Ammonia Plus Ammonium
Quality Control Data From 17/01/97 To 22/12/97
E3374A



NITROGEN, NITRATE

IDENTIFICATION:

Laboratory	Water Chemistry	Method Introduced	01/07/80
Method Reference No	E3148A	Reporting Unit	µg/Filter as N
LIMS Product Code	LOV3148, ANLOV3148, NYL3148, TEF3148, ANION3148	Supervisor	J. McBride
Sample Type/Matrix	Air; Sequential and LoVol filters		

SAMPLING:

Quantity Required	1 filter
Container	50 mL polypropylene tube

SAMPLE PREPARATION:

Filters are extracted with 50.0 mL of DDW (W40) or 25.0 mL of DDW (Teflon) or 25.0 mL of 0.03N NaOH (Nylon) in polypropylene tubes with ultrasonic treatment followed by a 24 hour rest period.

ANALYTICAL PROCEDURE:

Nitrate is separated from other anions in the sample by automated suppressed ion chromatography using an eluent mixture of 0.003 M sodium bicarbonate and 0.0024 M sodium carbonate with conductivity detection. Samples are spiked with $\text{Na}_2\text{CO}_3/\text{NaHCO}_3$ to match the eluent strength and maintain background conductivity. The concentration of nitrate in mg/L as N is determined by the comparison of the sample peak heights to a series of standards. Results are converted to µg/filter as N. Chloride and sulphate are determined simultaneously.

INSTRUMENTATION:

Ultrasonic bath; modular continuous flow ion chromatographic system plus microcomputer for automated sample injection, timing and partial data processing.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.01 mg/L	Current T value: 0.05 mg/L
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CALIBRATION:

BL plus 9 standards

CONTROLS:

Calibration	LTBL plus 2 standards, e.g. QCA
Drift	1 standard every 10 samples

NOTES:

Detection criterion is based on duplicate analyses of the extract from one filter because duplicate filters are not received. To convert unit from mg/L to µg/Filter, the concentration of N in mg/L is multiplied by 50 for W40 filters or 25 for Teflon and Nylon filters.

NITROGEN, NITRATE (E3148A)

QUALITY CONTROL DATA FROM 16/01/97 TO 09/12/97

Full Scale: to 2.0 mg/L as N

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	23	1.60	1.593	-0.007	0.0143
B:	23	0.40	0.380	-0.020	0.0124
A+B:	23	2.00	1.973	-0.027	0.0192
A-B:	23	1.20	1.213	0.013	0.0186

s.d.(AB) S(between runs): 0.013 Sw(within run): 0.013 S/Sw: 1.0

The calibration is accepted if the calibration control values obtained lie within the ranges:

1.93 - 2.07 for A+B
1.15 - 1.25 for A-B

DUPLICATES:

For W40 filters:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
15	0 - 0.40	0.0099	4.7
7	0.41 - 1.20	0.0074	0.9
3	1.21 - 2.00	0.0132	0.9
25	Overall	0.0098	

For Teflon filters:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
7	0 - 0.20	0.0100	13.3
16	0.21 - 0.40	0.0877	37.4
1	0.41 - 1.20	0.0073	0.90
0	1.21 - 2.00	N.A.	N.A.
24	Overall	0.0088	

NITROGEN, NITRATE cont'd (E3148A)

QUALITY CONTROL DATA FROM 16/01/97 TO 09/12/97

Full Scale: to 2.0 mg/L as N

DUPLICATES:

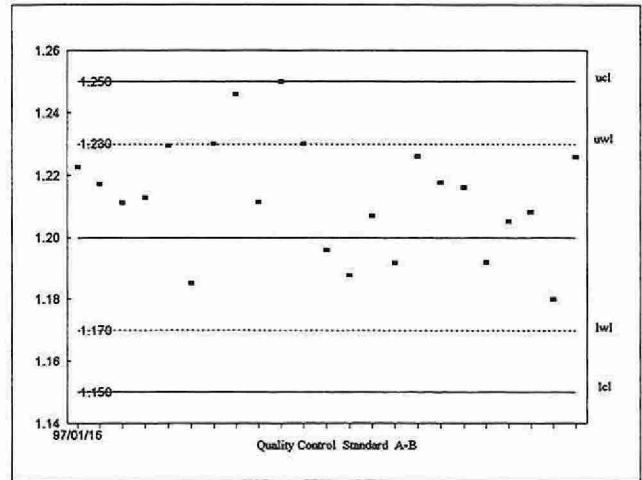
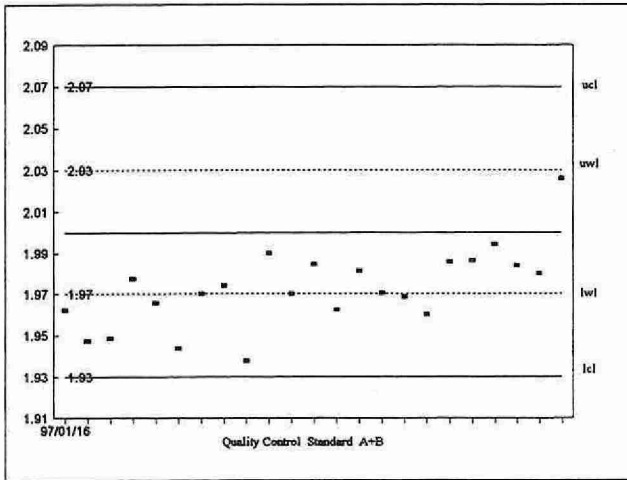
For Nylon filters:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
21	0 - 0.20	0.0057	5.0
10	0.21 - 0.40	0.0097	2.9
7	0.41 - 1.20	0.0064	1.2
0	1.21 - 2.00	N.A.	N.A.
38	Overall	0.0061	

OTHER CHECKS:

	n	Mean	Standard Deviation (1)
Long Term Blank	22	0.0012	0.0054

Nitrogen, Nitrate (mg/L as N)
Quality Control Data From 16/01/97 To 09/12/97
E3148A



NITROGEN, NITRATE

IDENTIFICATION:

Laboratory	Water Chemistry	Method Introduced	01/04/78
Method Reference No	E3372A	Reporting Unit	mg/L as N
LIMS Product Code	ANION3372	Supervisor	J. McBride
Sample Type/Matrix	Precipitation		

SAMPLING:

Quantity Required	15 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

Nitrate is separated from other anions in the sample by automated suppressed ion chromatography using an eluent mixture of 0.003 M sodium bicarbonate and 0.0024 M sodium carbonate with conductivity detection. Samples are spiked with $\text{Na}_2\text{CO}_3/\text{NaHCO}_3$ to match the eluent strength and maintain background conductivity. The concentration of nitrate in mg/L as N is determined by the comparison of the sample peak heights to a series of standards.

Sulphate and chloride are determined simultaneously.

INSTRUMENTATION:

Modular continuous flow ion chromatographic system plus microcomputer for automated sample injection, timing, and partial data processing.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.01	Current T value: 0.05
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CALIBRATION:

BL plus 7 standards

CONTROLS:

Calibration	LTBL plus 2 standards, e.g. QCA
Drift	1 standard every 10 samples

NOTES:

Formerly method E3147A, method number changed for LIMS in 1993 to E3372A.

NITROGEN, NITRATE (E3372A)

QUALITY CONTROL DATA FROM 07/01/97 TO 23/12/97

Full Scale: to 1.0 mg/L as N

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	26	0.80	0.796	-0.004	0.0070
B:	26	0.20	0.191	-0.009	0.0069
A+B:	26	1.00	0.987	-0.013	0.0104
A-B:	26	0.60	0.605	0.005	0.0092

s.d.(AB) S(between runs): 0.007 Sw(within run): 0.007 S/Sw: 1.1

The calibration is accepted if the calibration control values obtained lie within the ranges:

0.96 - 1.04 for A+B
0.57 - 0.63 for A-B

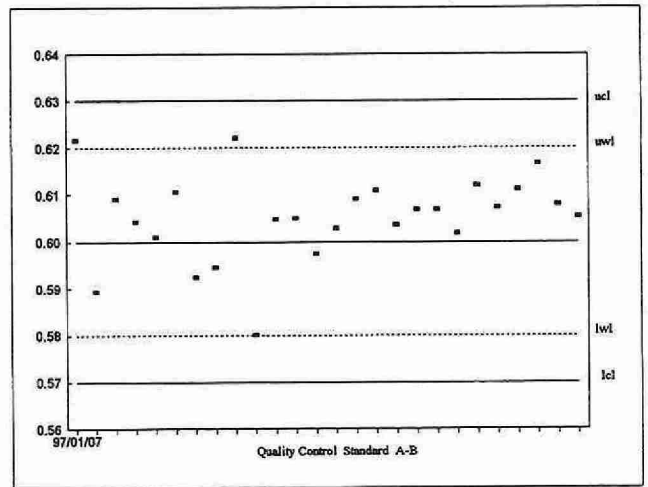
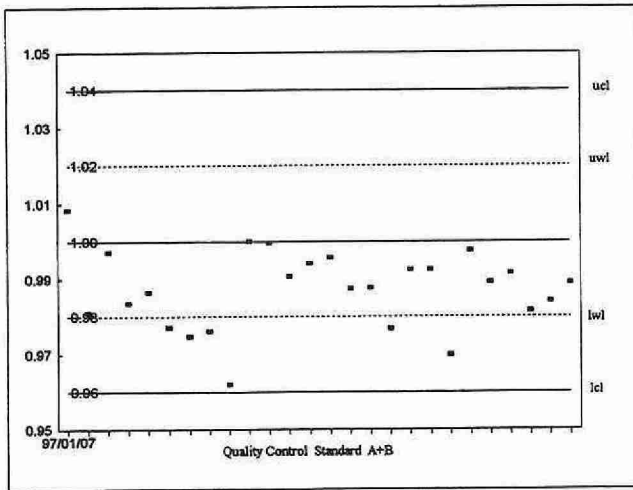
DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
4	0.00 - 0.20	0.0098	14.7
12	0.21 - 0.50	0.0075	3.6
12	0.51 - 1.00	0.0109	0.0
28	Overall	0.0089	0.0

OTHER CHECKS:

	n	Mean	Standard Deviation (1)
Long Term Blank	26	0.0028	0.0083

Nitrate (mg/L as N)
Quality Control Data From 07/01/97 To 23/12/97
E3372A



NITROGEN, NITRATE PLUS NITRITE

IDENTIFICATION:

Laboratory	Water Chemistry	Method Introduced	01/04/78
Method Reference No.	E3364A	Reporting Unit	mg/L as N
LIMS Product Code	DISNUT3364	Supervisor	J. McBride
Sample Type/Matrix	Dried Sludge, Sediment, Soil, Vegetation, Drinking Water, Ground Water, Surface Water		

SAMPLING:

Quantity Required	10 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

Nitrate plus nitrite is determined on the supernatant of a settled sample. Nitrate is reduced to nitrite in alkaline media at 37°C, by hydrazine sulphate with copper as a catalyst. Colourimetry is based on the formation of an azo dye by nitrite, sulphanilamide, and N(1-naphthyl) ethylenediamine dihydrochloride. To control metal ion interference, samples are passed through an ion-exchange column prior to the reduction step.

Approximate absorbance: 0.6 at the full scale level.

Ammonia plus ammonium, nitrite, and reactive orthophosphate are determined simultaneously.

INSTRUMENTATION:

Basic automated modular continuous flow system plus the following modules: 37°C heating bath (7.7 mL delay), ion exchange column. Colourimetric measurement is through a 1.5 cm. light path at 520 nm.

Data capture, reduction, and processing via a multi-stage microcomputer system.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.005	Current T value: 0.025
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CALIBRATION:

BL plus 7 standards

CONTROLS:

Calibration	LTBL plus 3 standards, e.g. QCA
Drift	BL every 10 samples; standard every 20 samples
Interference	Nitrate standard spiked with calcium (150 mg/L) and magnesium (50 mg/L) confirms effective interference suppression.
Recovery	Individual nitrate and nitrite standards of equal N concentration show effectiveness of reduction step.

NITROGEN, NITRATE PLUS NITRITE (E3364A)

QUALITY CONTROL DATA FROM 07/01/97 TO 23/12/97

Full Scale: to 5.00 mg/L as N

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	MeanBias	Standard Deviation (1)
A:	93	4.00	4.0001	0.0001	0.0503
B:	93	2.00	1.994	-0.006	0.0240
C:	93	0.400	0.396	-0.004	0.0132
A+B:	93	6.00	5.994	-0.006	0.0650
A-B:	93	2.00	2.006	0.006	0.0445
B+C:	93	2.40	2.39	-0.01	0.0302
B-C:	93	1.60	1.598	-0.002	0.0242

s.d.(AB) S(between runs):0.039

Sw(within run): 0.0314

S/Sw: 1.3

s.d.(BC) S(between runs):0.019

Sw(within run): 0.0171

S/Sw: 1.1

The calibration is accepted if the calibration control values obtained lie within the ranges:

5.868 - 6.132 for A+B
1.901 - 2.099 for A-B
2.328 - 2.472 for B+C
1.546 - 1.654 for B-C

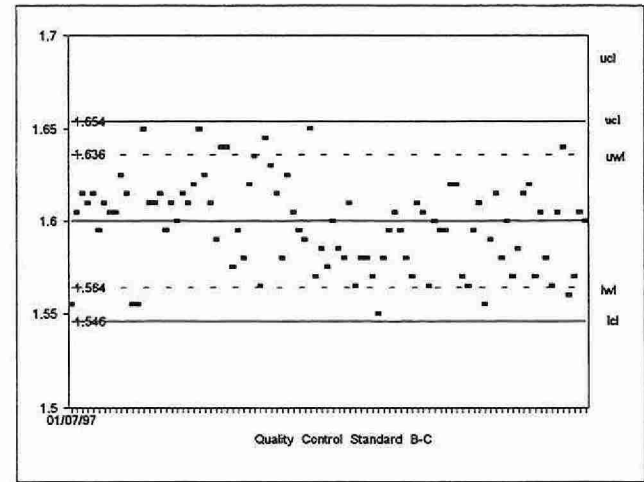
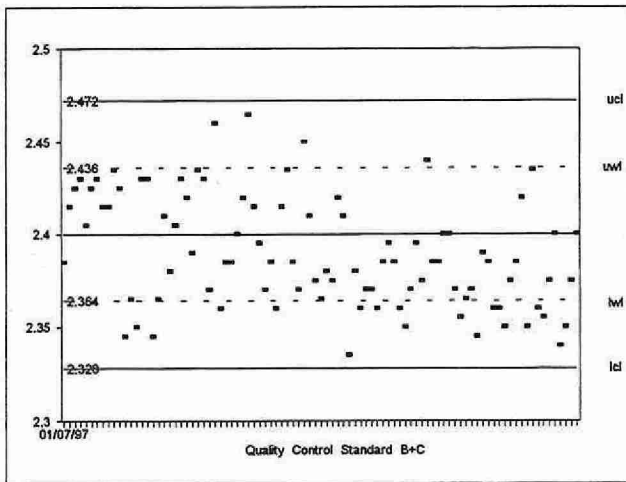
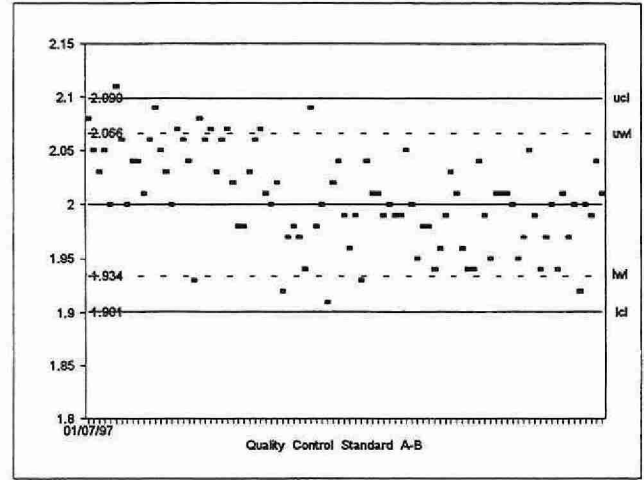
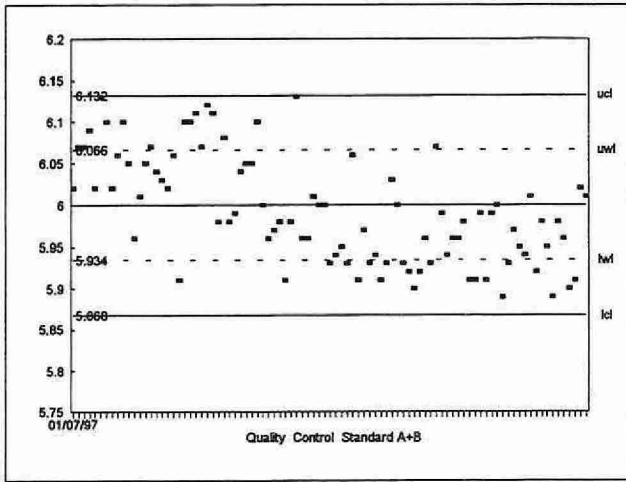
DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
172	0.000 - 0.500	0.0087	15.9
35	0.501 - 1.00	0.0195	3.0
36	1.01 - 2.50	0.0417	4.0
26	2.51 - 5.00	0.0471	1.3
269	Overall	0.0171	

OTHER CHECKS:

	n	Mean	Standard Deviation (1)
Long Term Blank	93	0.0062	0.0125

Nitrogen, Nitrate Plus Nitrite (mg/L as N)
Quality Control Data From 07/01/97 to 23/12/97
E3364A



NITROGEN, NITRATE PLUS NITRITE

IDENTIFICATION:

Laboratory	Water Chemistry	Method Introduced	01/04/78
Method Reference No.	E3366A	Reporting Unit	mg/L as N
LIMS Product Code	DISNUT3366	Supervisor	J. McBride
Sample Type/Matrix	Sludge, Effluent, Raw Sewage, Industrial Waste, Process Water, Leachate, Drinking Water, Ground Water		

SAMPLING:

Quantity Required	10 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

Nitrate plus nitrite is determined on the supernatant of a settled sample. Nitrate is reduced to nitrite in alkaline media at 38°C, by hydrazine sulphate with copper as a catalyst. Colourimetry is based on the formation of an azo dye by nitrite, sulphanilamide, and N(1-naphthyl) ethylenediamine dihydrochloride. To control metal ion interference, samples are passed through an ion-exchange column prior to the reduction step. Approximate absorbance: 0.7 at the full scale level. Ammonia plus ammonium, nitrite, and reactive phosphate are determined simultaneously.

INSTRUMENTATION:

Basic automated modular continuous flow system plus the following modules: 38°C heating bath (7.7 mL delay). Colourimetric measurement is through a 1.5 cm. light path at 520 nm. Two analytical ranges are obtained from the output of the colourimeter. Data capture, reduction, and processing via a multi - stage microcomputer system.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.05	Current T value: 0.25
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CALIBRATION:

BL plus 7 standards

CONTROLS:

Calibration	LTBL plus 3 standards, e.g. QCA
Drift	BL every 10 samples; standard every 20 samples
Interference	Nitrate standard spiked with calcium (150 mg/L) and magnesium (50 mg/L) confirms effective interference suppression.
Recovery	Individual nitrate and nitrite standards of equal N concentration show effectiveness of reduction step.

NITROGEN, NITRATE PLUS NITRITE (E3366A)

QUALITY CONTROL DATA FROM 10/01/97 TO 19/12/97

Laboratory Unit: Colourimetry

Full Scale: to 50.0 mg/L as N

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	82	40.0	40.129	0.129	0.3434
B:	82	20.0	20.101	0.101	0.2088
C:	82	4.0	4.015	0.015	0.0727
A+B:	82	60.0	60.232	0.232	0.4621
A-B:	82	20.0	20.027	0.027	0.3296
B+C:	82	24.0	24.118	0.118	0.2334
B-C:	82	16.0	16.087	0.087	0.2062

s.d.(AB) S(between runs): 0.28

Sw(within run): 0.23

S/Sw: 1.2

s.d.(BC) S(between runs): 0.16

Sw(within run): 0.15

S/Sw: 1.1

The calibration is accepted if the calibration control values obtained lie within the ranges:

58.66	-	61.34	for	A+B
18.99	-	21.01	for	A-B
23.28	-	24.72	for	B+C
15.46	-	16.54	for	B-C

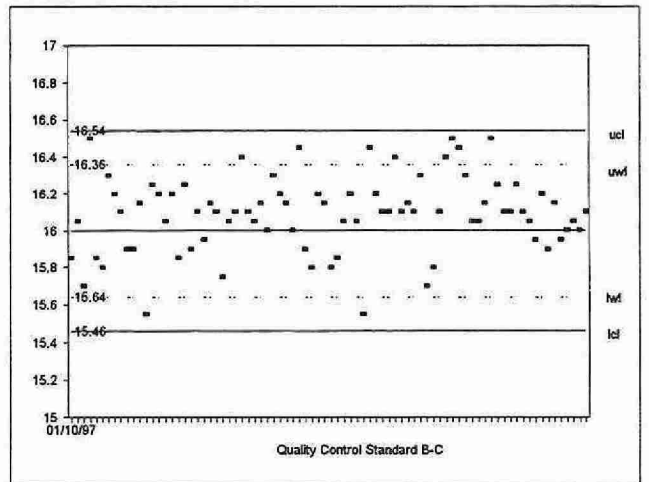
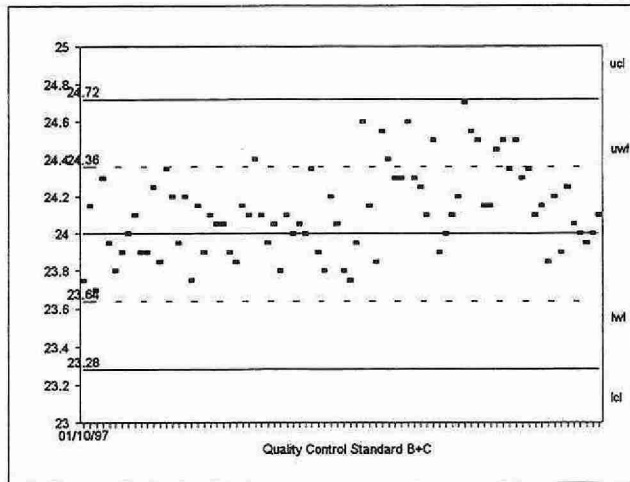
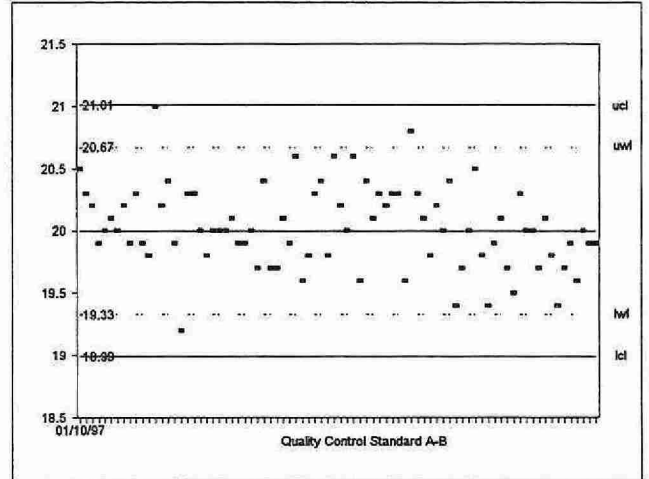
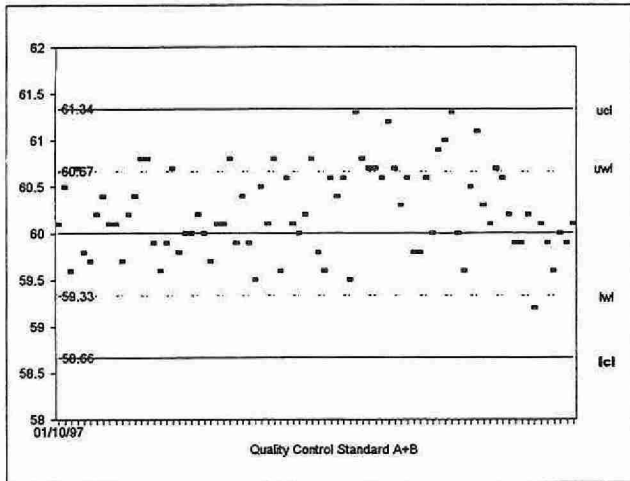
DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
162	0.00 - 5.00	0.0469	13.1
23	5.01 - 10.0	0.0896	2.0
24	10.1 - 25.0	0.2140	1.2
20	25.1 - 50.0	0.3958	1.3
229	Overall	0.0759	

OTHER CHECKS:

	n	Mean	Standard Deviation (1)
Long Term Blank	82	0.0585	0.0899

Nitrogen, Nitrate Plus Nitrite (mg/L as N)
Quality Control Data From 10/01/97 to 19/01/97
E3366A



NITROGEN, NITRATE PLUS NITRITE

IDENTIFICATION:

Laboratory	Water Chemistry	Method Introduced	01/04/76
Method Reference No.	E3369A	Reporting Unit	mg/L as N
LIMS Product Code	FNOT3369	Supervisor	J. McBride
Sample Type/Matrix	Effluent, Industrial Waste, Process Water, Drinking Water, Ground Water, Leachate, Surface Water		

SAMPLING:

Quantity Required	50 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

Nitrate plus nitrite is determined on the supernatant of a settled sample. Nitrate is reduced to nitrite in alkaline media at 38°C, by hydrazine sulphate with copper as a catalyst. Colourimetry is based on the formation of an azo dye by nitrite, sulphanilamide, and N(1-naphthyl) ethylenediamine dihydrochloride. To control metal ion interference, samples are passed through an ion-exchange column prior to the reduction step. Approximate absorbance: 0.5 at the full scale level.

INSTRUMENTATION:

Basic automated modular continuous flow system plus the following modules: 37°C heating bath (7.7 mL delay), ion exchange column. Colourimetric measurement is through a 1.5 cm. light path at 520 nm. Data capture, reduction, and processing via a multi-stage microcomputer system.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.1	Current T value: 0.5
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CALIBRATION:

BL plus 6 standards

CONTROLS:

Calibration	LTB plus 3 standards, e.g. QCA
Drift	BL every 10 samples; standard every 20 samples
Interference	Nitrate standard spiked with calcium (150 mg/L) and magnesium (50 mg/L) confirms effective interference suppression.
Recovery	Individual nitrate and nitrite standards of equal N concentration show effectiveness of reduction step.

NOTES:

Sept. '94 the method codes WFNO3-E3221A, and E3220A were amalgamated and a new method code WFNO3-E3369A was generated.

NITROGEN, NITRATE PLUS NITRITE (E3369A)

QUALITY CONTROL DATA FROM 02/01/97 TO 29/12/97

Full Scale: to 20.0 mg/L as N

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	48	16.0	15.997	0.003	0.1345
B:	48	8.0	8.044	0.044	0.0649
C:	48	1.6	1.600	0.000	0.0000
A+B:	48	24.0	24.042	0.042	0.1527
A-B:	48	8.0	7.954	0.046	0.1458
B+C:	48	9.6	9.644	0.044	0.0649
B-C:	91	6.4	6.444	0.044	0.0649

s.d.(AB) S(between runs): 0.10

Sw(within run): 0.10

S/Sw: 1.0

s.d.(BC) S(between runs): 0.05

Sw(within run): 0.05

S/Sw: 1.0

The calibration is accepted if the calibration control values obtained lie within the ranges:

23.21	-	24.79	for	A+B
7.41	-	8.59	for	A-B
9.15	-	10.05	for	B+C
5.95	-	6.85	for	B-C

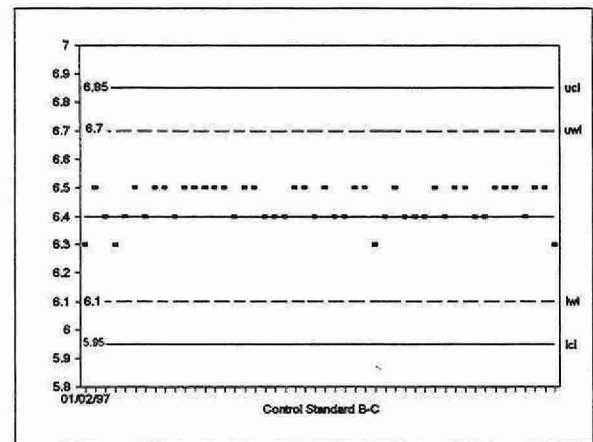
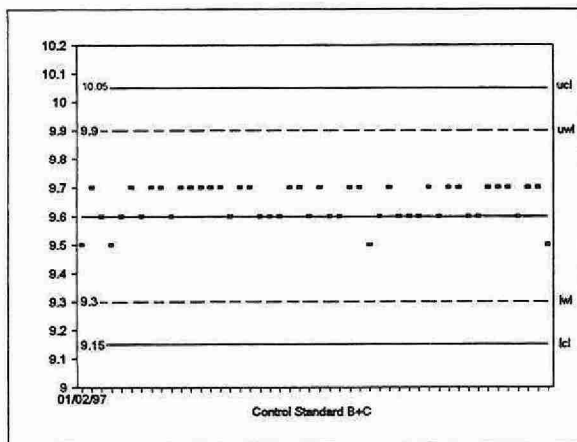
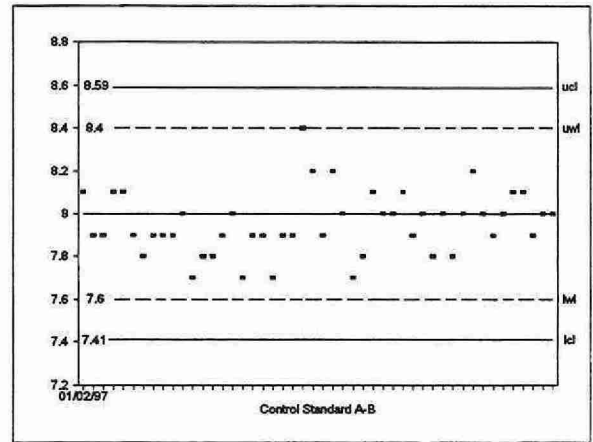
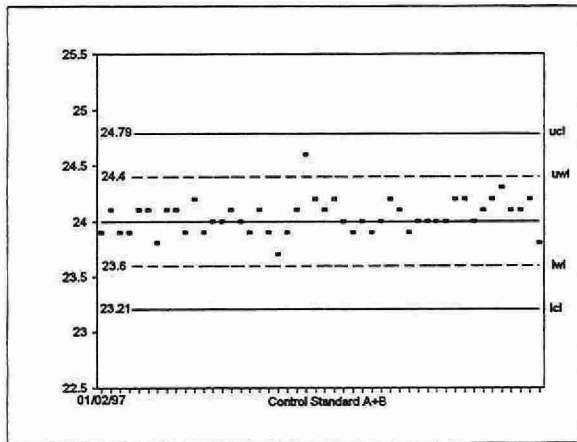
DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
119	0.0 - 2.0	0.0330	8.3
12	2.1 - 4.0	0.0354	1.3
6	4.1 - 10.0	0.1080	1.6
6	10.1 - 20.0	0.1080	0.8
143	Overall	0.0446	

OTHER CHECKS:

	n	Mean	Standard Deviation (1)
Long Term Blank	48	0.002	0.0144

Nitrogen, Nitrate Plus Nitrite
Quality Control Data From 02/01/97 To 29/12/97
E3369A



NITROGEN, NITRATE PLUS NITRITE

IDENTIFICATION:

Laboratory	Dorset	Method Introduced	13/06/78
Method Reference No.	E3374A	Reporting Unit	µg/L as N
LIMS Product Code	AMMNO3374	Supervisor	F. Tomassini
Sample Type/Matrix:	Surface Waters, Precipitation, Leachate		

SAMPLING:

Quantity Required:	50 mL
Container:	Glass or plastic

ANALYTICAL PROCEDURE:

Nitrate plus nitrite is determined on the supernatant of a sample. Nitrate is reduced to nitrite in alkaline media at 37°C, by hydrazine sulphate with copper as a catalyst. Colourimetry is based on the formation of an azo dye by nitrite, sulphanilamide, and N(1-naphthyl) ethylenediamine dihydrochloride. To control metal ion interference, samples are passed through an ion-exchange column prior to the reduction step.

Approximate absorbance : 0.4 at the full scale level.

Ammonia plus ammonium is determined simultaneously.

INSTRUMENTATION:

Basic automated modular continuous flow system plus the following modules: 37°C heating bath (7.7 mL delay), ion exchange column. Colourimetric measurement is through a 5.0 cm. light path at 520 nm.

REPORTING:

Maximum Significant Figures: 3	Current W value: 2	Current T value: 10
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CALIBRATION:

BL plus 8 standards

CONTROLS:

Calibration	LTBL plus 3 QC standards, e.g. QCA
Drift	BL every 10 samples and BL plus check standard every 20 samples

NOTES:

JAN. 1995 LIMS replaced LIS and the method reference no. was changed from E3034A to E3374A. LIMS product code is AMMNO3374.

NITROGEN, NITRATE PLUS NITRITE (E3374A)

QUALITY CONTROL DATA FROM 17/01/97 TO 22/12/97

Full Scale: to 1000 µg/L as N

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	30	600	598.7	-1.3	5.2975
B:	30	200	197.7	-2.3	2.7207
C:	30	60	59.2	-0.8	1.8399
A+B:	30	800	796.4	-3.6	6.4466
A-B:	30	400	401.1	1.1	5.4198
B+C:	30	260	256.8	-3.2	3.7882
B-C:	30	140	138.5	-1.5	2.6878

s.d.(AB) S(between runs): 4.21

Sw(within run): 3.83

S/Sw: 1.1

s.d.(BC) S(between runs): 2.32

Sw(within run): 1.90

S/Sw: 1.2

The calibration is accepted if the calibration control values obtained lie within the ranges:

780	-	820	for A+B
385	-	415	for A-B
248	-	272	for B+C
131	-	149	for B-C

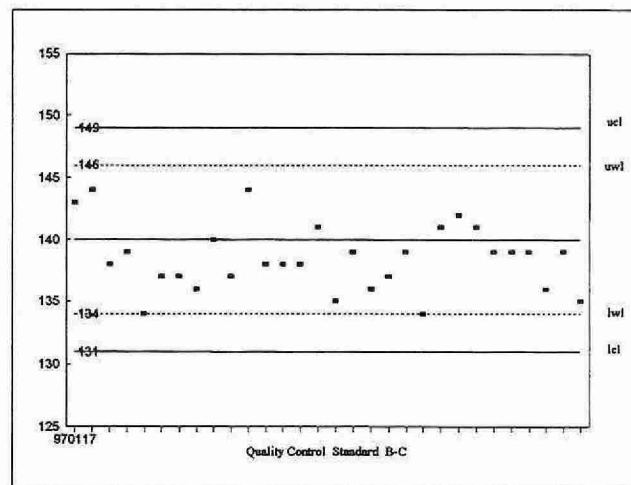
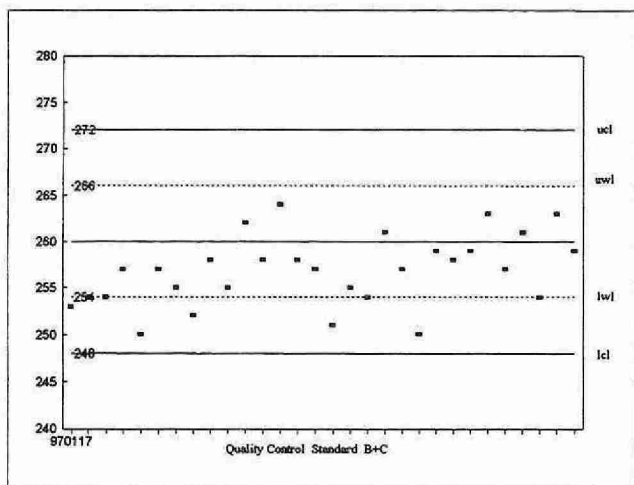
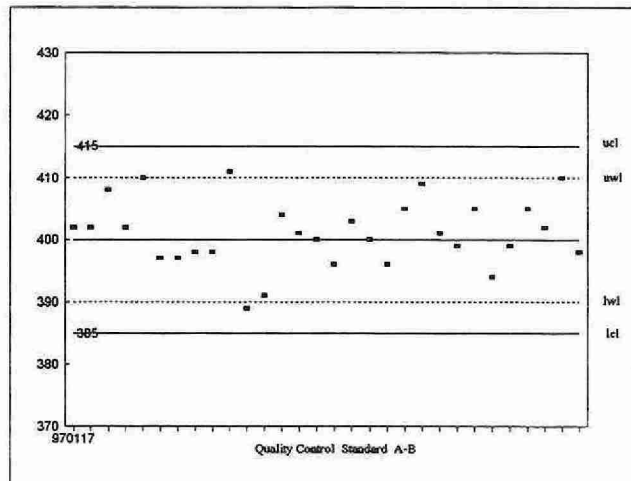
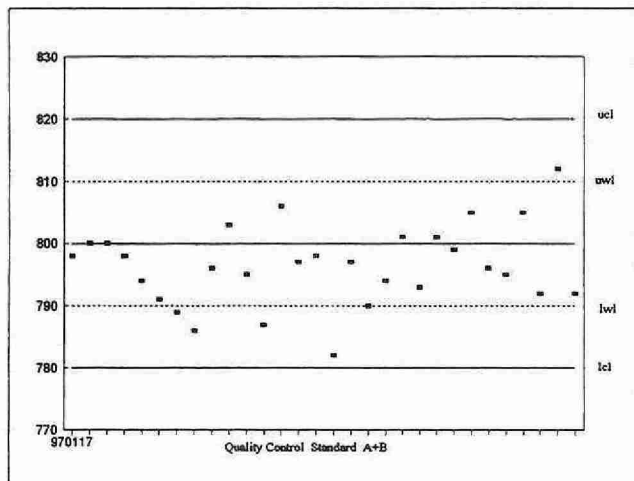
DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
38	0.0 - 100	1.2568	7.2
11	101 - 200	1.3885	0.9
27	201 - 500	6.4034	2.5
12	501 - 1000	21.879	2.7
88	Overall	3.2325	

OTHER CHECKS:

	n	Mean	Standard Deviation (1)
Long Term Blank	30	1.3	1.1492

Nitrogen, Nitrate Plus Nitrite
Quality Control Data From 17/01/97 To 22/12/97
E3374A



NITROGEN, NITRITE

IDENTIFICATION:

Laboratory	Water Chemistry	Method Introduced	01/04/78
Method Reference No.	E3364A	Reporting Unit	mg/L as N
LIMS Product Code	DISNUT3364	Supervisor	J. McBride
Sample Type/Matrix	Dried Sludge, Sediment, Soil, Vegetation, Drinking Water, Ground Water, Surface Water		

SAMPLING:

Quantity Required	10 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

Nitrite is determined on the supernatant of a settled sample by formation of an azo dye using sulphanilamide, and N(1-naphthyl) ethylenediamine dihydrochloride.

Approximate absorbance: 0.6 at the full scale level.

Ammonia plus ammonium, nitrate plus nitrite, and reactive orthophosphate are determined simultaneously.

INSTRUMENTATION:

Basic automated modular continuous flow system with colourimetric measurement through a 5.0 cm. light path at 520 nm.

Data capture, reduction, and processing via a multi-stage microcomputer system.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.001	Current T value: 0.005
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CALIBRATION:

BL plus 7 standards

CONTROLS:

Calibration	LTBL plus 3 standards, e.g. QCA
Drift	BL every 10 samples; standard every 20 samples
Interference	Nitrate standard spiked with calcium (150 mg/L) and magnesium (50 mg/L) confirms effective interference suppression.
Recovery	Individual nitrate and nitrite standards of equal N concentration show effectiveness of reduction step.

NITROGEN, NITRITE (E3364A)

QUALITY CONTROL DATA FROM 07/01/97 TO 23/12/97

Full Scale: to 0.200 mg/L as N

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	93	0.160	0.1602	0.0002	0.0025
B:	93	0.080	0.079	-0.001	0.0012
C:	93	0.016	0.0157	-0.0003	0.0007
A+B:	93	0.240	0.239	-0.001	0.0034
A-B:	93	0.080	0.081	0.001	0.0019
B+C:	93	0.096	0.095	-0.001	0.0016
B-C:	93	0.064	0.063	-0.001	0.0011

s.d.(AB) S(between runs):0.0019

Sw(within run): 0.0013

S/Sw: 1.5

s.d.(BC) S(between runs):0.0010

Sw(within run): 0.0008

S/Sw: 1.2

The calibration is accepted if the calibration control values obtained lie within the ranges:

0.234 - 0.246 for A+B
0.076 - 0.084 for A-B
0.092 - 0.100 for B+C
0.061 - 0.067 for B-C

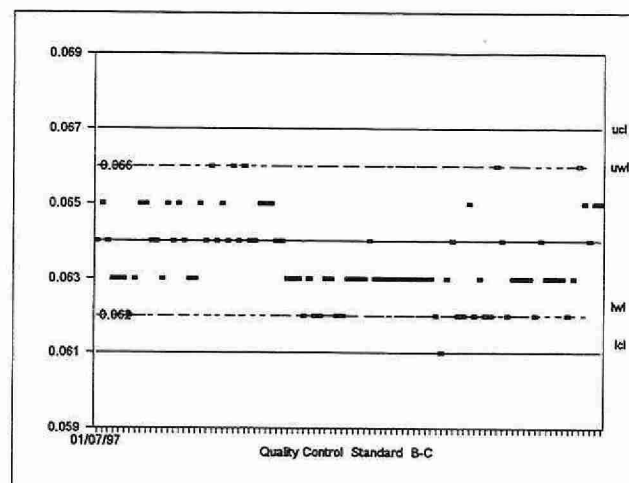
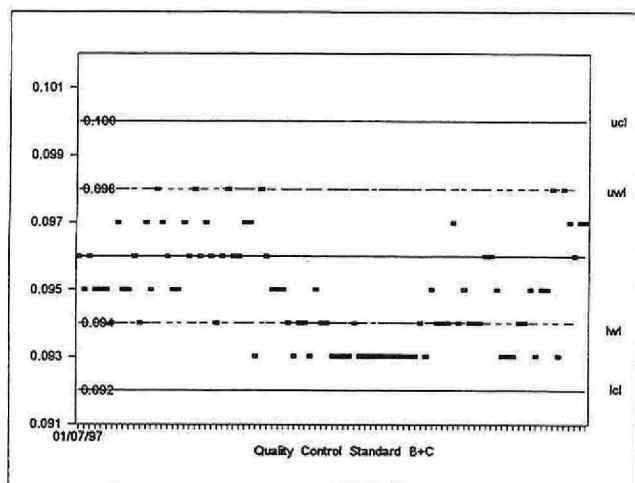
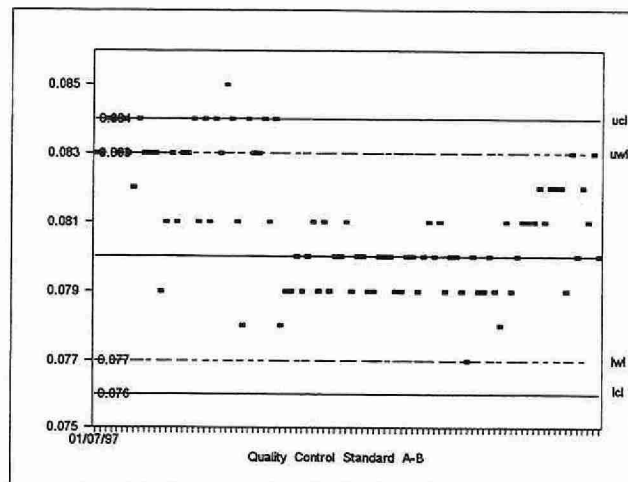
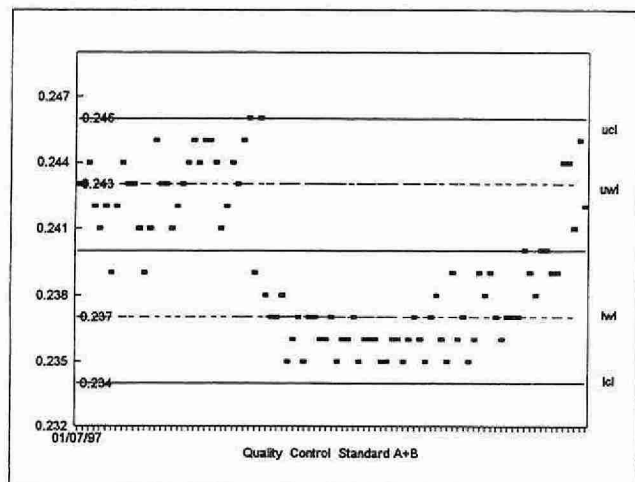
DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
223	0.000 - 0.020	0.00081	19.3
18	0.021 - 0.040	0.00115	4.6
20	0.041 - 0.100	0.00145	3.5
15	0.101 - 0.200	0.00134	1.0
276	Overall	0.00091	

OTHER CHECKS:

	n	Mean	Standard Deviation (1)
Long Term Blank	93	0.0005	0.0007

Nitrogen, Nitrite (mg/L as N)
Quality Control Data From 07/01/97 to 23/12/97
E3364A



NITROGEN, NITRITE

IDENTIFICATION:

Laboratory	Water Chemistry	Method Introduced	01/04/78
Method Reference No	E3366A	Reporting Unit	mg/L as N
LIMS Product Code	DISNUT3366	Supervisor	J. McBride
Sample Type/Matrix	Sludge, Effluent, Raw Sewage, Industrial Waste, Process Water, Leachate, Drinking Water, Ground Water		

SAMPLING:

Quantity Required	10 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

Nitrite is determined on the supernatant of a settled sample by formation of an azo dye using sulphanilamide, and N(1-naphthyl) ethylenediamine dihydrochloride.

Approximate absorbance: 0.3 at the full scale level.

Ammonia plus ammonium, nitrate plus nitrite, and reactive orthophosphate are determined simultaneously.

INSTRUMENTATION:

Basic automated modular continuous flow system with colourimetric measurement through a 5.0 cm. light path at 520 nm. Data capture, reduction, and processing via a multi-stage microcomputer system.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.005	Current T value: 0.025
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CALIBRATION:

BL plus 7 standards

CONTROLS:

Calibration	LTBL plus 3 standards, e.g. QCA
Drift	BL every 10 samples; standard every 20 samples
Interference	Nitrate standard spiked with calcium (150 mg/L) and magnesium (50 mg/L) confirms effective interference suppression.
Recovery	Individual nitrate and nitrite standards of equal N concentration show effectiveness of reduction step.

NITROGEN, NITRITE (E3366A)

QUALITY CONTROL DATA FROM 10/01/97 TO 19/12/97

Laboratory Unit: Colourimetry

Full Scale: to 2.00 mg/L as N

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	83	1.60	1.6064	0.0064	0.0099
B:	83	0.80	0.8028	0.0028	0.0051
C:	83	0.160	0.1602	0.0002	0.0025
A+B:	83	2.40	2.4092	0.0092	0.0118
A-B:	83	0.80	0.8036	0.0036	0.0106
B+C:	83	0.960	0.9631	0.0031	0.0059
B-C:	83	0.640	0.6426	0.0026	0.0055

s.d.(AB) S(between runs): 0.0079

Sw(within run): 0.0075

S/Sw: 1.1

s.d.(BC) S(between runs): 0.0040

Sw(within run): 0.0039

S/Sw: 1.0

The calibration is accepted if the calibration control values obtained lie within the ranges:

2.352	-	2.448	for	A+B
0.764	-	0.836	for	A-B
0.936	-	0.984	for	B+C
0.622	-	0.658	for	B-C

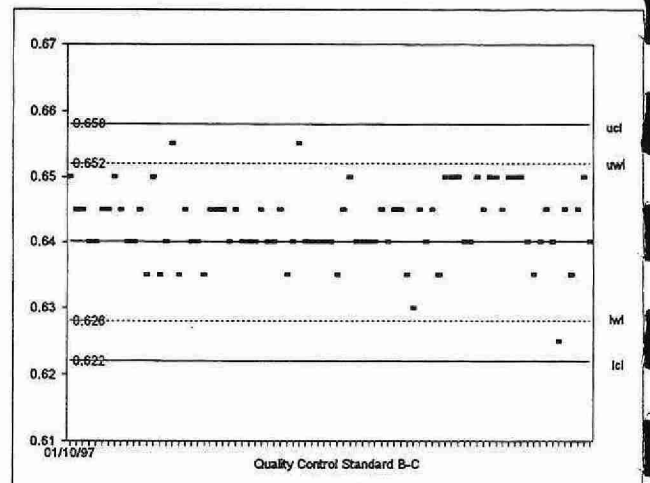
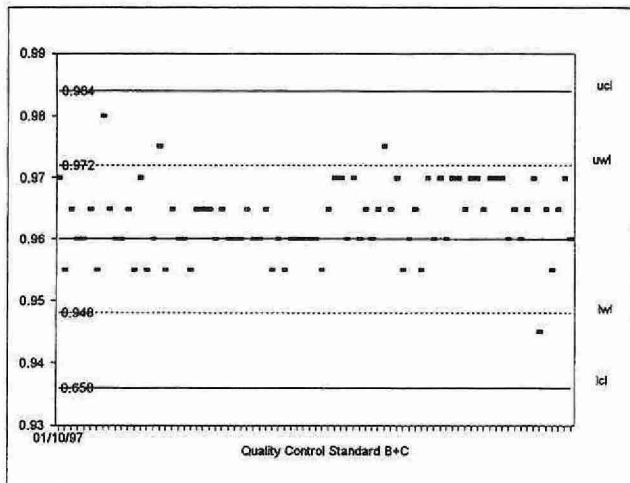
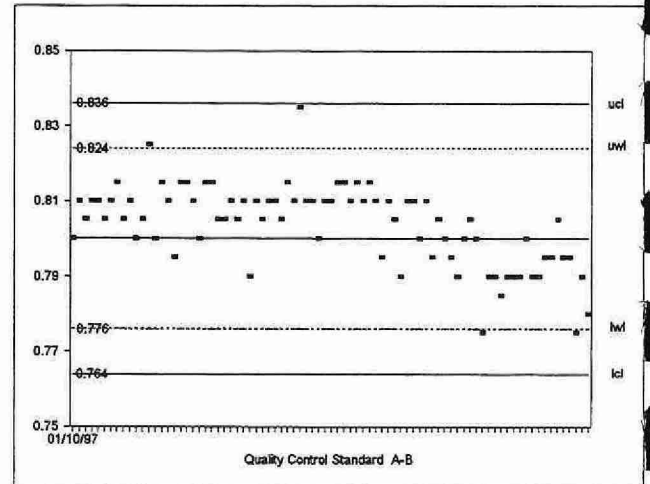
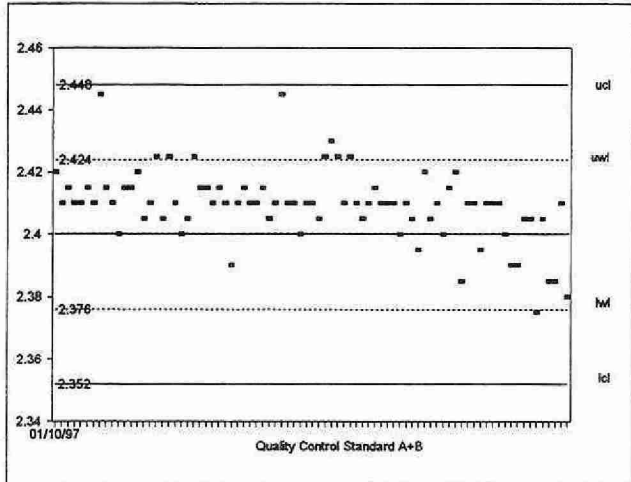
DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
168	0.000 - 0.200	0.0080	21.2
10	0.201 - 0.400	0.0118	4.1
14	0.401 - 1.00	0.0308	4.1
12	1.01 - 2.00	0.0363	3.0
204	Overall	0.0045	

OTHER CHECKS:

	n	Mean	Standard Deviation (1)
Long Term Blank	83	0.0019	0.0027

Nitrogen, Nitrite (mg/L as N)
Quality Control Data from 01/10/97 to 19/12/97
E3366A



NITROGEN, TOTAL KJELDAHL

IDENTIFICATION:

Laboratory	Water Chemistry	Method Introduced	Mar '89
Method Reference No.	E3116A	Reporting Unit	mg/g as N
LIMS Product Code	TNP3116	Supervisor	J. McBride
Sample Type/Matrix	Soil, Sediment, Dried Sludge		

SAMPLING:

Quantity Required	0.08 to 0.4 g
Container	Glass or plastic

ANALYTICAL PROCEDURE:

Nitrogen compounds are converted to simple inorganic forms by dissolution of the samples in hot sulphuric acid and potassium persulphate. Potassium persulphate is added later in the digestion to raise the boiling point and to provide a highly oxidizing environment to decompose the more resistant organic matter. The digestate is analyzed using an automated colourimetric system.

INSTRUMENTATION:

Hot plate .

Basic automated modular continuous flow system : 37.5°C bath. Colourimetric measurement is through a 5 cm. light path at 630 nm.

Data capture, and processing via a microcomputer system.

REPORTING:

Maximum Significant Figures: 2 decimal places	Current W value: 0.1	Current T value: 0.5
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CALIBRATION:

3 High and 2 Low Calibration Standards

CONTROLS:

Calibration	In house composite B-Soil/sediment, plus QC Soils/Sediment (RS92)
Drift	4 BL's per run; high and low calibration standard at the end of the run
Recovery	1 digested BL plus 4 digested standards

NOTES:

System is calibrated with undigested standards.

NITROGEN, TOTAL KJELDAHL (E3116A)

QUALITY CONTROL DATA FROM 01/01/97 TO 24/11/98

Full Scale: 10 mg/g as N

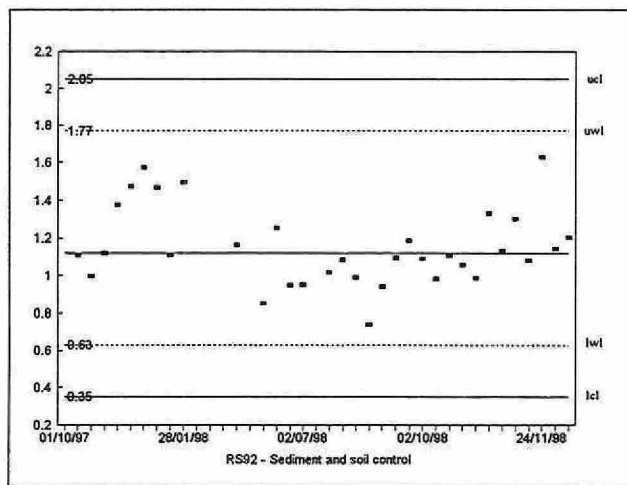
CALIBRATION CONTROL:

	n	Mean Concentration	Standard Deviation (1)
RS92	34	1.12	0.2845

The calibration is accepted if the calibration control values obtained lie within the ranges:
0.35 - 2.05 for RS92

DUPLICATES: (Sediment/Soils)

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
40	0.00 - 2.00	0.1518	18.2
15	2.01 - 4.00	0.2124	2.9
19	4.01 - 10.0	0.8212	10.8
3	10.1 - 20.0	1.2431	10.0
77	Overall	0.4974	



NITROGEN, TOTAL KJELDAHL

IDENTIFICATION:

Laboratory	Water Chemistry	Method Introduced	Mar '89
Method Reference No.	E3118A	Reporting Unit	mg/g as N
LIMS Product Code	TNP3118	Supervisor	J. McBride
Sample Type/Matrix	Vegetation, Moss Bag		

SAMPLING:

Quantity Required	0.02 to 0.04 g
Container	Glass or plastic

ANALYTICAL PROCEDURE:

Nitrogen compounds are converted to simple inorganic forms by dissolution of the samples in hot sulphuric acid and potassium persulphate. Potassium persulphate is added later in the digestion to raise the boiling point and to provide a highly oxidizing environment to decompose the more resistant organic matter. The digestate is analyzed using an automated colourimetric system.

INSTRUMENTATION:

Hot plate.

Basic automated modular continuous flow system : 37.5°C bath. Colourimetric measurement is through a 5 cm. light path at 630 nm.

Data capture, and processing via a microcomputer system.

REPORTING:

Maximum Significant Figures: 2 decimal places	Current W value: 0.20	Current T value: 1.00
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CALIBRATION:

3 High and 2 Low Calibration Standards

CONTROLS:

Calibration	In house composite A-VEG, plus QC VEG (Pine Needles)
Drift	4 BL's per run; high and low calibration standard at the end of the run
Recovery	1 digested BL plus 4 digested standards

NOTES:

System is calibrated with undigested standards.

NITROGEN, TOTAL KJELDAHL (E3118A)

QUALITY CONTROL DATA FROM 01/01/97 TO 31/12/98

Full Scale: 100 mg/g as N

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
Pine Needles	3	12.10	10.3	-1.8	0.1530

The calibration is accepted if the calibration control values obtained lie within the ranges:
10.3 - 13.9 for Pine Needles

DUPLICATES: (Vegetation)

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
3	0.0 - 5.0	0.1373	3.9
4	5.1 - 10.0	0.7899	9.7
5	10.1 - 25.0	3.6484	20.5
3	25.1 - 50.0	3.2028	9.7
15	Overall	2.5804	

NITROGEN, TOTAL KJELDAHL

IDENTIFICATION:

Laboratory	Water Chemistry	Method Introduced	01/04/79
Method Reference No.	E3367A	Reporting Unit	mg/L as N
LIMS Product Code	TOTNUT3367	Supervisor	J. McBride
Sample Type/Matrix	Precipitation, Drinking Water, Ground Water , Surface Water		

SAMPLING:

Quantity Required	50 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

Samples are digested in a sulphuric acid-mercuric oxide-potassium sulphate media using three block digestors kept at 180°C, 210°C and 360°C. The pH of the digestate is adjusted in-line in two stages and then ammonia is determined by formation of indophenol blue in a buffered system using nitroprusside as a catalyst.

Approximate absorbance: 0.3 at the full scale level.

Total phosphorus is determined simultaneously.

INSTRUMENTATION:

Three block digesters

Basic automated modular continuous flow system plus 1 module: 38°C bath (7.7 mL delay).

Colourimetric measurement is through a 5.0 cm. light path at 630 nm.

Data capture, reduction, and processing via a multi-stage microcomputer system

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.02	Current T value: 0.1
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CALIBRATION:

BL plus 7 undigested standards

CONTROLS:

Calibration	LTBL plus 3 undigested standards, e.g. QCA
Drift	BL every 10 samples; undigested standard every 20 samples
Recovery	3 digested BL plus 3 digested standards in duplicate, e.g. R1

NITROGEN, TOTAL KJELDAHL (E3367A)

QUALITY CONTROL DATA FROM 10/01/97 TO 18/12/97

Full Scale: to 2.00 mg/L as N

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	98	1.60	1.598	-0.002	0.0158
B:	98	0.800	0.799	-0.001	0.0129
C:	98	0.160	0.1596	-0.0004	0.0085
A+B:	98	2.40	2.397	-0.003	0.0226
A-B:	98	0.800	0.799	-0.001	0.0179
B+C:	98	0.960	0.958	-0.002	0.0172
B-C:	98	0.640	0.639	-0.001	0.0134

s.d.(AB)	S(between runs):	0.0002	Sw(within run):	0.00016	S/Sw: 1.3
s.d.(BC)	S(between runs):	0.00009	Sw(within run):	0.0001	S/Sw: 1.3

The calibration is accepted if the calibration control values obtained lie within the ranges:

2.32	-	2.48	for	A+B
0.740	-	0.860	for	A-B
0.913	-	1.007	for	B+C
0.605	-	0.675	for	B-C

RECOVERIES:

Number of Data	Expected Concentration	Mean Concentration	Standard Deviation (1)
98	1.40	1.409	0.1371
98	0.840	0.850	0.0389
98	0.280	0.291	0.0582

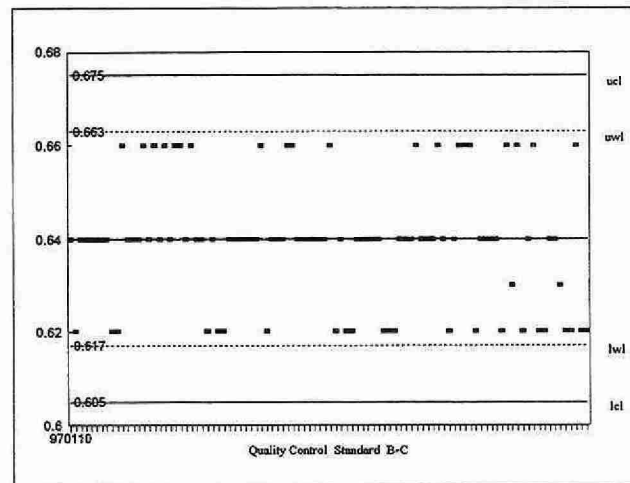
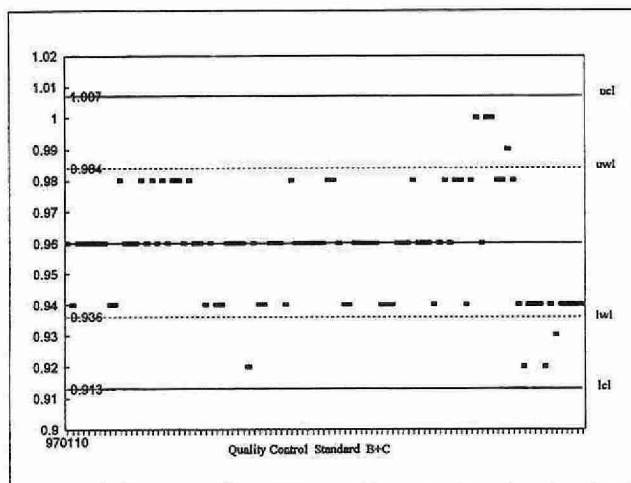
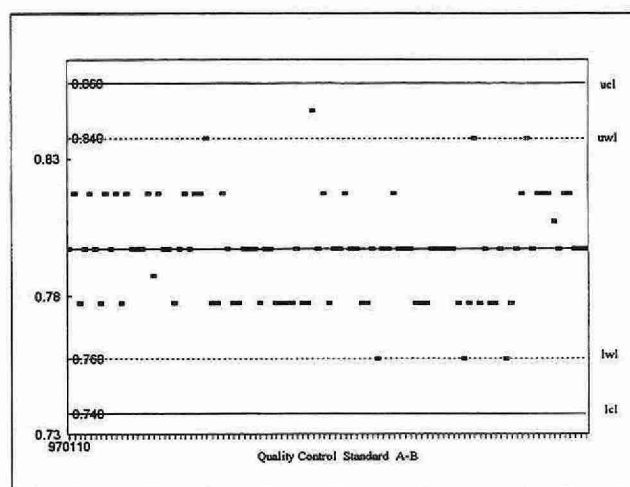
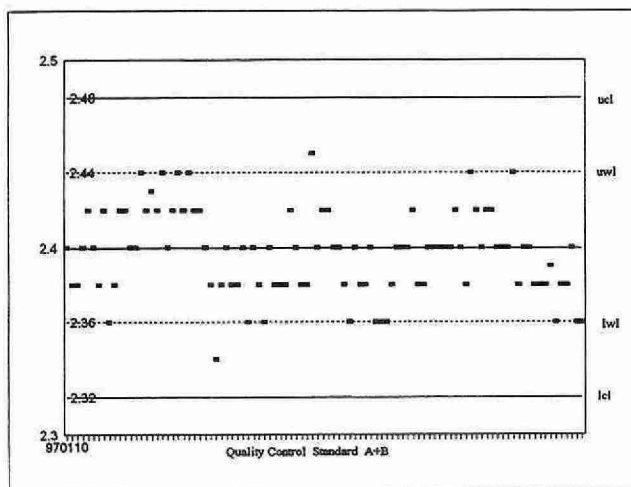
DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
76	0.000 - 0.200	0.0307	21.2
116	0.201 - 0.400	0.0203	20.7
86	0.401 - 1.00	0.0200	7.6
10	1.01 - 2.00	0.0337	9.3
286	Overall	0.0189	

OTHER CHECKS:

	n	Mean	Standard Deviation (1)
Long Term Blank	98	-0.010	0.0119
Digested Blank	98	-0.017	0.0206

Nitrogen, Total Kjeldahl (mg/L as N)
 Quality Control Date From 10/01/97 To 18/12/97
 E3367A



NITROGEN, TOTAL KJELDAHL

IDENTIFICATION:

Laboratory	Water Chemistry	Method Introduced	01/04/79
Method Reference No	E3368A	Reporting Unit	mg/L as N
LIMS Product Code	TOTNUT3368	Supervisor	J. McBride
Sample Type/Matrix	Sludge, Raw Sewage, Industrial Waste, Drinking Water, Effluent, Ground Water, Process Water, Leachate		

SAMPLING:

Quantity Required	50 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

Samples are digested in a sulphuric acid-mercuric oxide-potassium sulphate media using three block digestors kept at 180°C, 210°C and 360°C. The pH of the digestate is adjusted in-line in two stages and then ammonia is determined by formation of indophenol blue in a buffered system using nitroprusside as a catalyst.

Approximate absorbance: 1.1 at the full scale level.

Total phosphorus is determined simultaneously.

INSTRUMENTATION:

Three block digesters

Basic automated modular continuous flow system plus 1 module: 38°C bath (7.7 mL delay).

Colourimetric measurement is through a 1.5 cm. light path at 630 nm.

Data capture, reduction, and processing via a multi-stage microcomputer system

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.05	Current T value: 0.25
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CALIBRATION:

BL plus 7 undigested standards

CONTROLS:

Calibration	LTBL plus 3 undigested standards, e.g. QCA
Drift	BL every 10 samples; undigested standard every 20 samples
Recovery	3 digested BL plus 3 digested standards in duplicate, e.g. R1

NOTES:

System is calibrated with undigested standards.

NITROGEN, TOTAL KJELDAHL (E3368A)

QUALITY CONTROL DATA FROM 06/01/97 TO 16/12/97

Full Scale: to 50.0 mg/L as N

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	52	40.0	40.067	0.067	0.1958
B:	52	20.0	20.033	0.033	0.1133
C:	52	4.0	4.995	-0.005	0.0748
A+B:	52	60.0	60.100	0.100	0.2642
A-B:	52	20.0	20.035	0.035	0.1803
B+C:	52	24.0	24.028	0.028	0.1513
B-C:	52	16.0	16.038	0.038	0.1182

s.d.(AB)	S(between runs):	0.026	Sw(within run):	0.016	S/Sw: 1.6
s.d.(BC)	S(between runs):	0.009	Sw(within run):	0.007	S/Sw: 1.3

The calibration is accepted if the calibration control values obtained lie within the ranges:

59.27	-	60.73	for	A+B
19.45	-	20.55	for	A-B
23.58	-	24.42	for	B+C
15.68	-	16.32	for	B-C

RECOVERIES:

Number of Data	Expected Concentration	Mean Concentration	Standard Deviation (1)
52	35	34.91	0.7851
52	21	20.84	0.6639
52	7	6.95	0.2200

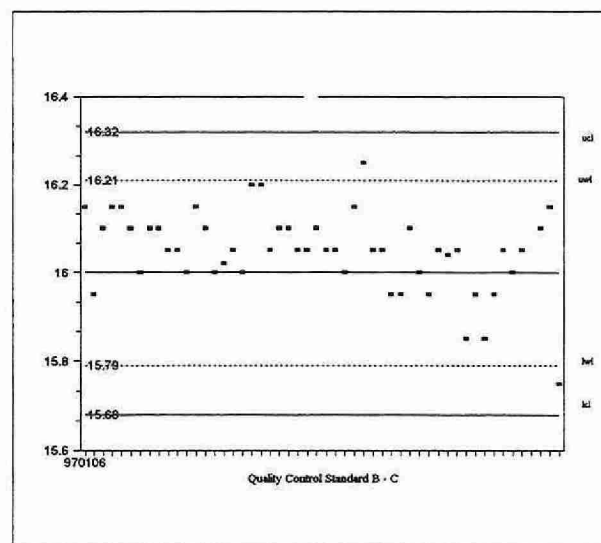
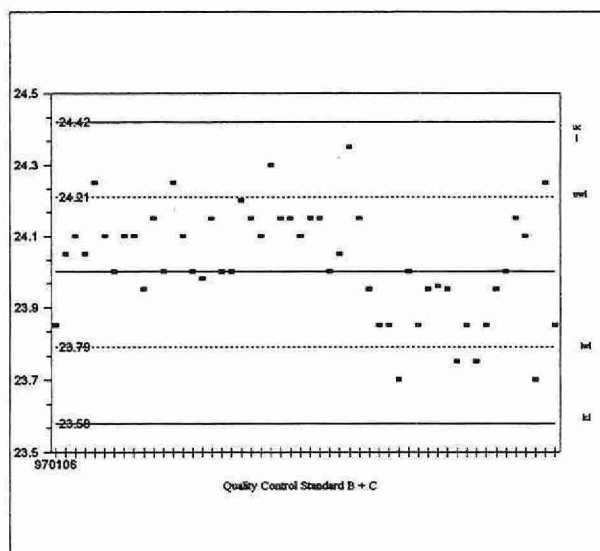
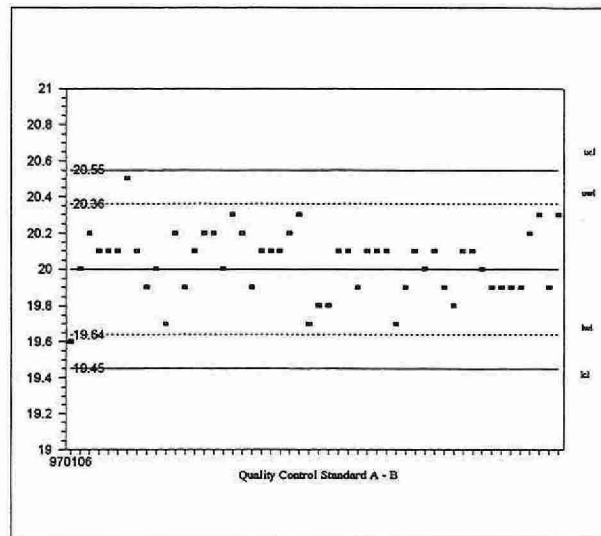
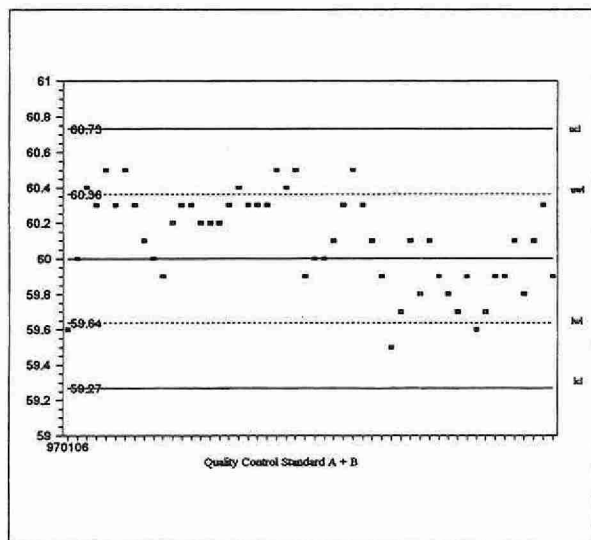
DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
100	0.00 - 5.00	0.0923	0.1
100	5.01 - 10.0	0.2697	0.3
10	10.1 - 25.0	0.6731	0.7
16	25.1 - 50.0	0.6435	0.6
226	Overall	0.1568	

OTHER CHECKS:

	n	Mean	Standard Deviation (1)
Long Term Blank	52	0.025	0.0490
Digested Blank	52	0.013	0.0477

Nitrogen, Total Kjeldahl (mg/L as N)
Quality Control Data from 06/01/97 to 16/12/97
E3368A



OXYGEN DEMAND, BIOCHEMICAL

IDENTIFICATION:

Laboratory	Water Chemistry	Method Introduced	Before '61
Method Reference No.	E3182A	Reporting Unit	mg/L as O
LIMS Product Code	BOD3182	Supervisor	J. McBride
Sample Type/Matrix	Raw Sewage, Industrial Waste, Effluent, Drinking Water, Ground Water, Leachate, Surface Water		

SAMPLING:

Quantity Required:	400 mL
Container:	Glass or plastic

SAMPLE PREPARATION:

If necessary sample pH is adjusted to neutral and chlorine is removed by reaction with sodium sulphite.

ANALYTICAL PROCEDURE:

Oxygen depletion is measured as the difference in dissolved oxygen (DO) concentration. DO readings are taken prior to sample storage, and also at the end of storage in the dark at 20°C for five days (BOD5). If necessary, dilutions are made with aerated, nutrient-enriched water to obtain a 25-75% oxygen depletion. If the sample has undergone any of the sample preparation steps listed above or if the sample is an industrial waste, a sewage seed is added. For such samples, calculation of an appropriate seed correction is required.

INSTRUMENTATION:

- YSI Model 59 DO meter (Yellow Springs Instrument Company) with DO probe equipped with stirrer and fitted with a Teflon membrane of 0.5 mil thickness which is permeable to oxygen (1 mil = 0.001 inch).
- Titration equipment for Winkler analysis of dissolved oxygen.
- Incubator (19-21°C); BOD bottles (300 mL)

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.2	Current T value: 1
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CALIBRATION (DO):

The standard is air-saturated reversed osmosis deionized water. The DO content is read from a table (ORBISPHERE LABORATORIES - Pressure temperature dissolved oxygen table) after measuring its temperature and the barometric pressure in the laboratory.

OXYGEN DEMAND, BIOCHEMICAL cont'd

CONTROLS:

Calibration (DO)	2 QC solutions of Pure-DW water which have been partially stripped of DO by flushing with nitrogen. These "solutions", of different but unknown DO, are compared using the Oxygen meter and the Winkler titration procedure. The difference between the values for the two analytical methods is utilized as a slope control for the DO Analyzer.
Recovery (BOD5)*	3 Recovery standards prepared from a combination of Glucose and Glutamic Acid e.g. R1; the expected BOD5 is 67% of the oxygen requirement for complete oxidation.
Drift	Air saturated Pure-DW water after every 24 samples.
Blanks*	Pure-DW water and BOD dilution water

NOTES:

* These solutions are incubated for five days alongside samples.

OXYGEN DEMAND, BIOCHEMICAL (E3182A)

QUALITY CONTROL DATA FROM 03/01/97 TO 31/12/97

Full Scale: to 9.0 mg/L as O at 20°C

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	104	0.00	0.00	0.00	0.00
B:	104	0.00	0.02	0.02	0.06

On any given day the calibration is accepted if the values obtained lie within the ranges:

-0.25 - 0.25

RECOVERIES:

Number of Data	Expected Depletion	Mean Depletion	Standard Deviation (1)
52	2.20	2.10	0.1463
52	4.34	4.16	0.1925
52	6.52	6.19	0.2469

DUPLICATES:

n Data Pairs	Sample Depletion Span	Standard Deviation (2)	Coefficient of variation(%)
18	0.0 - 1.8	0.2030	17.5
27	1.9 - 4.5	0.3369	10.9
7	4.6 - 9.0	0.5010	8.6
52	Overall	0.3436	

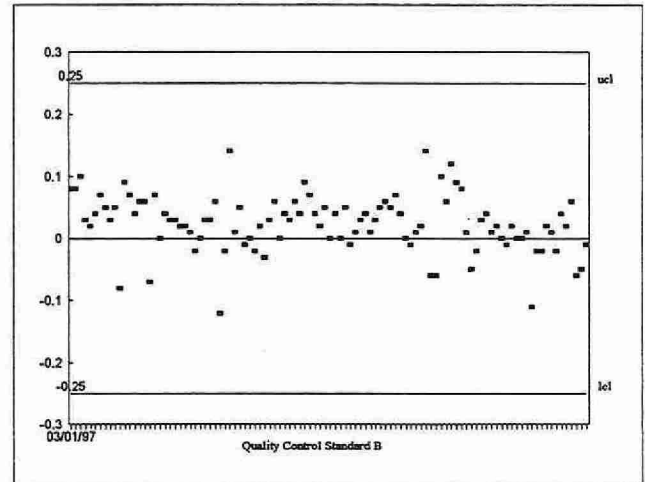
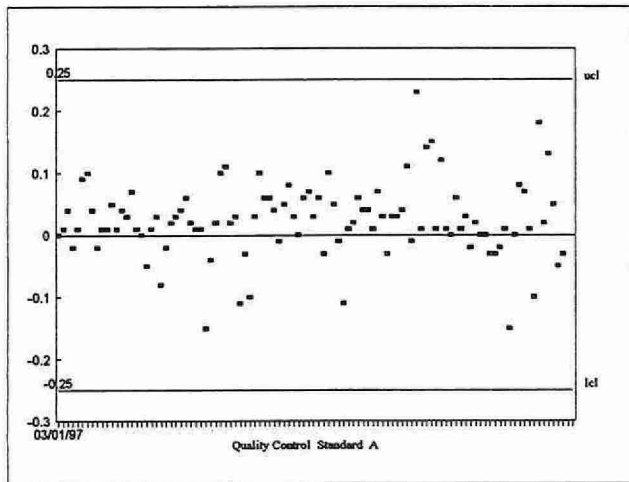
OTHER CHECKS:

	n	Mean	Standard Deviation (1)
5 Day Pure-DW Blank	52	0.183	0.1504
5 Day BOD Blank	52	0.202	0.1576

NOTES:

The final concentration of BOD in mg/L as O is determined by the oxygen depletion after 5 days at 20°C multiplied by a dilution and seed correction factor.

Oxygen Demand, Biochemical (mg/L as O)
Quality Control Data From 03/01/97 To 31/12/97
E3182A



OXYGEN DEMAND, CHEMICAL

IDENTIFICATION:

Laboratory	Water Chemistry	Method Introduced	01/07/82
Method Reference No.	E3170A	Reporting Unit	mg/L as O
LIMS Product Code	COD3170	Supervisor	J. McBride
Sample Type/Matrix	Drinking Water, Ground Water, Surface Water		

SAMPLING:

Quantity Required	25 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

Samples (10.0 mL) are mixed with an acidified potassium dichromate solution which contains mercuric sulphate to suppress chloride interference. After adding concentrated sulphuric acid containing silver sulphate as a catalyst, the mixture is digested in a mechanical-convection oven for 3 hours at 149°C. Analysis is completed by automated colourimetric measurement of trivalent chromium. Approximate absorbance: 0.05 at the full scale level.

INSTRUMENTATION:

- Culture tubes with Teflon closures; mechanical-convection oven
- Basic automated modular continuous flow system with colourimetric measurement through a 5.0 cm. light path at 600 nm.

REPORTING:

Maximum Significant Figures: 3	Current W value: 1	Current T value: 5
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CALIBRATION:

3 digested BL plus 3 digested standards

CONTROLS:

Calibration	2 digested standards, e.g. QCA
Drift	Undigested BL every 10 samples; standard plus BL at end of run
Recovery	2 digested standards, e.g. R1
Interference	Digested standard (40 mg/L as O) spiked with 50 mg/L Cl confirms suppression of chloride interference.

NOTES:

In order to retard sample decomposition the first reagent (acidified dichromate) is added as soon as possible at the laboratory. Analysis is scheduled for completion within the week. The recovery standard is a material known to be very difficult to digest. The expected recovery is approximately 85%, based on long term experience. We continue to use this material in spite of the poor recovery, because if the slightest problem exists with the digestion step, the recovery falls off sharply to approximately 10%.

OXYGEN DEMAND, CHEMICAL (E3170A)

QUALITY CONTROL DATA FROM 07/01/97 TO 22/12/97

Full Scale: to 40.0 mg/L as O

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	40	40.0	40.44	0.44	1.0367
B:	40	10.0	9.73	-0.27	0.9604
A+B:	40	50.0	50.17	0.17	1.6098
A-B:	40	30.0	30.71	0.71	1.1843

s.d.(AB)

S(between runs): 1.35

Sw(within run): 1.59

S/Sw: 0.85

On any given day the calibration is accepted if the calibration control values obtained lie within the ranges:

46.3 - 53.7 for A+B
27.2 - 32.8 for A-B

RECOVERIES:

Number of Data	Expected Concentration	Mean Concentration	Standard Deviation (1)
40	40	38.17	2.2478
40	10	9.37	1.4073

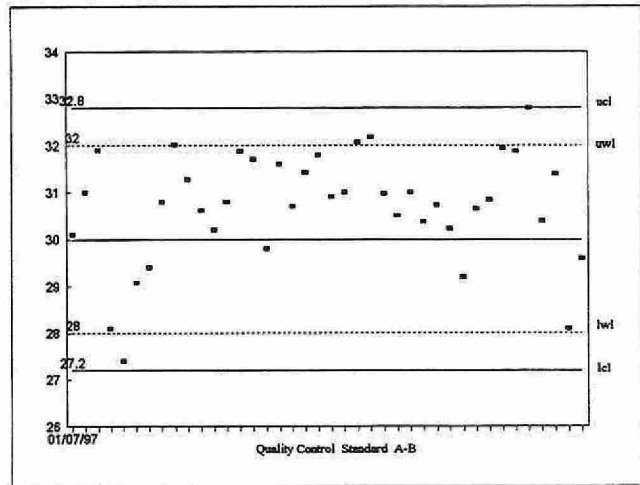
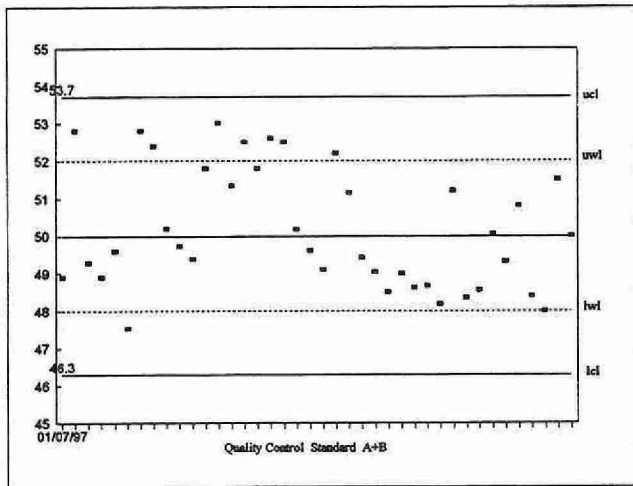
DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
12	0 - 8	1.2606	31.1
41	9 - 20	1.4629	10.6
25	21 - 40	1.8213	6.0
79	Overall	1.5498	

OTHER CHECKS:

	n	Mean	Standard Deviation (1)
Chloride Check	40	38.2	2.2479

Oxygen Demand, Chemical (mg/L as O)
Quality Control Data From 07/01/97 To 22/12/97
E3170A



OXYGEN DEMAND, CHEMICAL

IDENTIFICATION:

Laboratory	Water Chemistry	Method Introduced	01/07/82
Method Reference No.	E3246A	Reporting Unit	mg/L as O
LIMS Product Code	COD3246	Supervisor	J. McBride
Sample Type/Matrix	Raw Sewage, Industrial Waste, Ground Water, Leachate, Effluent, Sludge, Surface Water, Process Water		

SAMPLING:

Quantity Required	25 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

Samples (10.0 mL) are mixed with an acidified potassium dichromate solution which contains mercuric sulphate to suppress chloride interference. After adding concentrated sulphuric acid containing silver sulphate as a catalyst, the mixture is digested in a mechanical-convection oven for 3 hours at 149°C. Analysis is completed by automated colourimetric measurement of trivalent chromium. Approximate absorbance: 0.6 at the full scale level.

INSTRUMENTATION:

-Basic automated modular continuous flow system with colourimetric measurement through a 5.0 cm. light path at 600 nm.

REPORTING:

Maximum Significant Figures: 3	Current W value: 2	Current T value: 10
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CALIBRATION:

2 digested BL plus 4 digested standards

CONTROLS:

Calibration	2 digested standards, e.g. QCA
Drift	Undigested BL every 10 samples; standard plus BL at end of run
Recovery	2 digested standards, e.g. R1
Interference	Digested standard (50 mg/L as O) spiked with 900 mg/L Cl confirms suppression of chloride interference.

NOTES:

In order to retard sample decomposition the first reagent (acidified dichromate) is added as soon as possible at the laboratory. Analysis is scheduled for completion within the week. The recovery standard is a material known to be very difficult to digest. The expected recovery is approximately 85%, based on long term experience. We continue to use this material in spite of the poor recovery, because if the slightest problem exists with the digestion step, the recovery falls off sharply to approximately 10%.

OXYGEN DEMAND, CHEMICAL (E3246A)

QUALITY CONTROL DATA FROM 07/01/97 TO 22/12/97

Full Scale: to 500.0 mg/L as O

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	31	400	395.4	-4.6	6.1388
B:	31	100	98.8	-1.2	4.2827
A+B:	31	500	494.3	-5.7	7.3469
A-B:	31	300	296.6	-3.4	7.6207

s.d.(AB)

S(between runs): 5.3

Sw(within run): 5.4

S/Sw: 1.0

On any given day the calibration is accepted if the calibration control values obtained lie within the ranges:

477.5 - 522.5 for A+B
285.0 - 315.0 for A-B

RECOVERIES:

Number of Data	Expected Concentration	Mean Concentration	Standard Deviation (1)
31	390	388.2	5.1094
31	98	95.1	4.9020

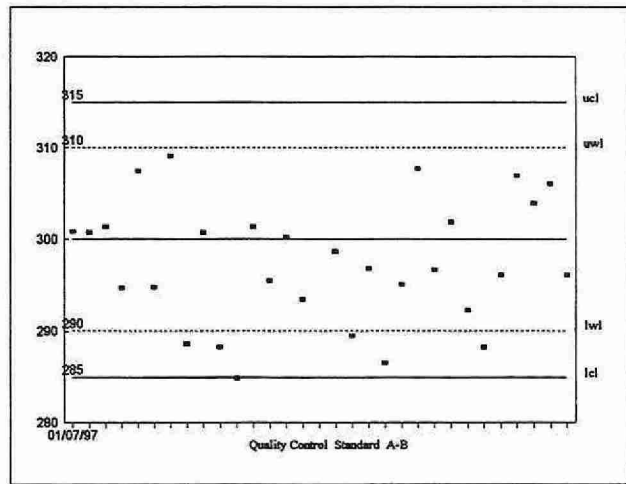
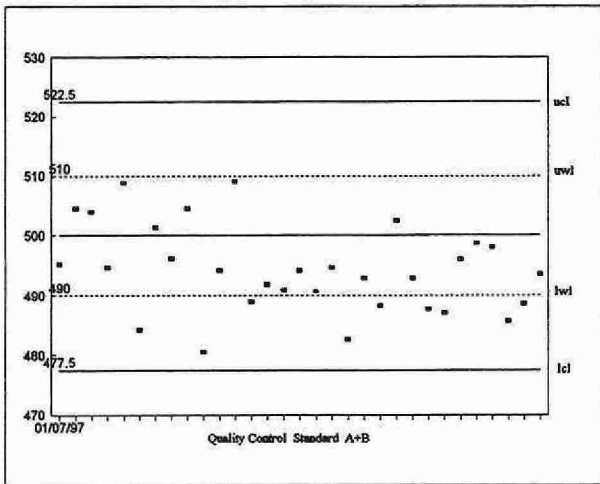
DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
20	0 - 50	2.9118	11.6
7	51 - 100	3.7332	4.7
24	101 - 250	4.6773	3.0
5	251 - 500	6.5192	1.9
56	Overall	4.2356	

OTHER CHECKS:

	n	Mean	Standard Deviation (1)
Chloride Check	31	55.7	5.7706

Oxygen Demand, Chemical (mg/L as O)
Quality Control Data From 07/01/97 To 22/12/97
E3246A



pH

IDENTIFICATION:

Laboratory	Dorset	Method Introduced	01/01/76
Method Reference No.	E3042A	Reporting Units	dimensionless
LIMS Product Code	PHALK3042	Supervisor	J. McBride
Sample Type/Matrix:	Leachate, Precipitation, Surface Water		

SAMPLING:

Quantity Required:	150 mL
Container:	250 mL Amber polyethylene or BOD bottle filled to the brim; screw caps with cone-shaped liners are preferred.

ANALYTICAL PROCEDURE:

pH is measured directly on a stirred sample (100 mL) at room temperature. Stirring rate, beaker size, degree of electrode immersion and room temperature range are uniform for all samples and standards. Alkalinity (Gran) is performed simultaneously.

INSTRUMENTATION:

Digital pH meter, stirrer, combined glass electrode.

REPORTING:

Maximum Significant Figures: 3

CALIBRATION:

2 standard buffers covering the pH range of 4 to 7

CONTROLS:

Calibration	BL plus 2 standards, e.g. QCA
Drift	2 standard buffers - 2 times daily

pH (E3042A)

QUALITY CONTROL DATA FROM 10/01/97 TO 22/12/97

Analytical Range: to 14.00 Dimensionless

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	86	6.86	6.87	0.01	0.0136
B:	86	4.01	3.998	-0.002	0.0136
A+B:	86	10.87	10.9	0.003	0.0201
A-B:	86	2.85	2.9	0.05	0.0183

s.d.(AB) S(between runs): 0.014

Sw:(within run): 0.013

S/Sw: 1.0

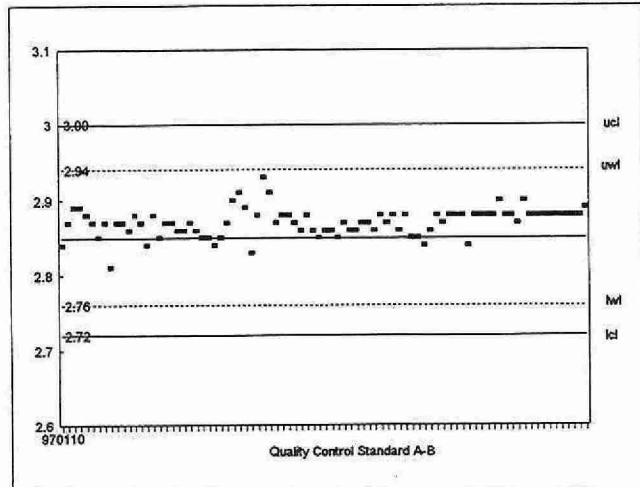
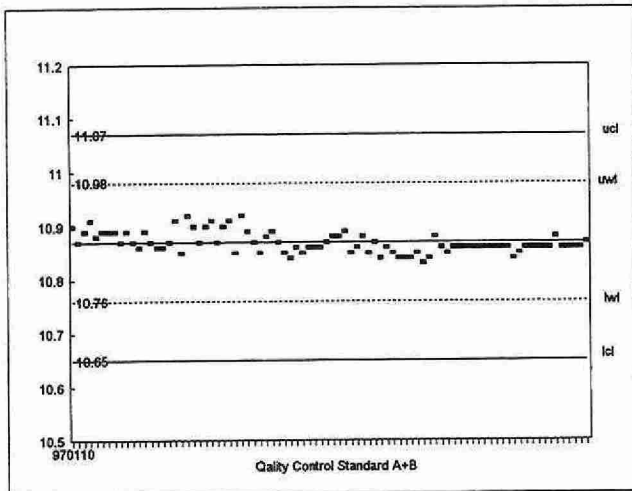
On any given day the calibration is accepted if the values obtained lie within the ranges:

10.65 - 11.07 for A+B
2.72 - 3.00 for A-B

DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
88	3.5 - 5.00	0.0209	4.2
85	5.01 - 6.00	0.0256	1.9
83	6.01 - 7.00	0.0250	1.3
116	7.01 - 9.00	0.0366	1.0
372	Overall	0.0278	

pH
Quality Control Data from 10/01/97 to 22/12/97
E3042A



pH

IDENTIFICATION:

Laboratory	Water Chemistry	Method Introduced	09/07/80
Method Reference No	E3218A	Reporting Units	Dimensionless
LIMS Product Code	PHALCO3218, CONDPH3218	Supervisor	J. McBride
Sample Type/Matrix	Raw Sewage, Drinking Water, Effluent		

SAMPLING:

Quantity Required	50 mL
Container	Glass or Plastic

ANALYTICAL PROCEDURE:

pH is directly measured on a stirred sample (10.0 mL) at room temperature. Stirring rate, tube size, degree of electrode immersion, and room temperature range are uniform for all samples and standards. Total fixed endpoint alkalinity, and conductivity are determined simultaneously.

INSTRUMENTATION:

Automated modular titration system with microcomputer control and data processing software.

REPORTING:

Maximum Significant Figures: 3

CALIBRATION:

2 standard buffers covering the pH range of 4 to 9

CONTROLS:

Calibration	2 QC standards e.g. QCA
Drift	In run standards throughout the run (diluted tap water 50% V/V)

pH (E3218A)

QUALITY CONTROL DATA FROM 09/01/97 TO 22/12/97

Analytical Range: to 14.00 Dimensionless

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	54	7.41	7.44	0.02	0.0299
B:	54	4.45	4.50	0.05	0.0434
A+B:	54	11.86	11.94	0.08	0.0446
A-B:	54	2.96	2.93	-0.03	0.0596

s.d.(AB) S(between runs): 0.037

Sw(within run): 0.042

S/Sw: 0.9

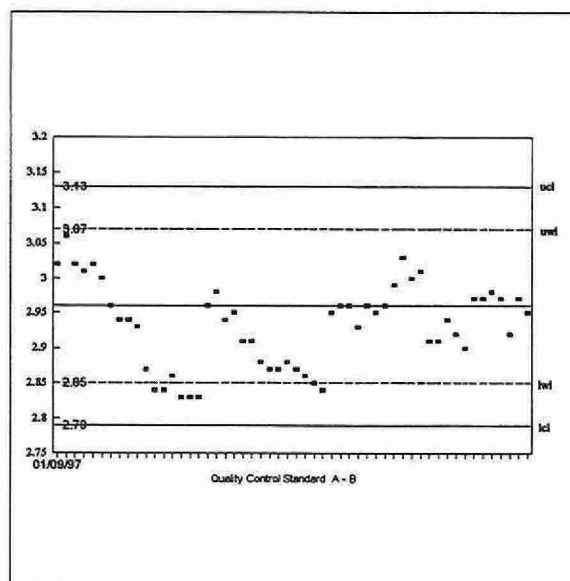
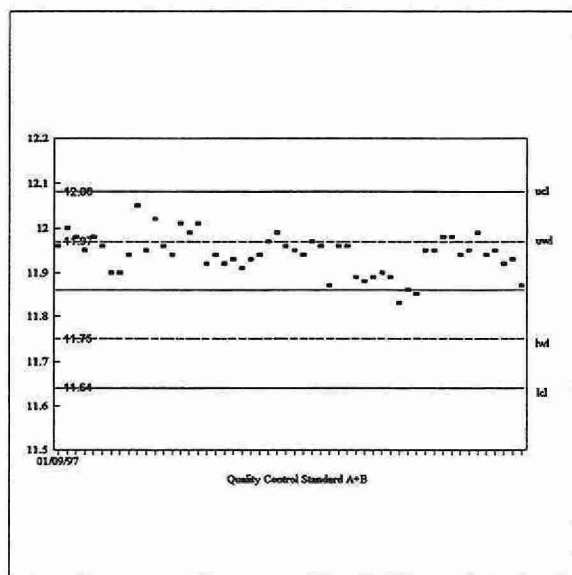
On any given day the calibration is accepted if the values obtained lie within the ranges:

11.64 - 12.08 for A+B
2.79 - 3.13 for A-B

DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
16	1.00 - 7.00	0.0149	0.3
79	7.01 - 8.00	0.0214	0.5
47	8.01 - 12.00	0.0261	0.5
142	Overall	0.0230	

pH
Quality Control Data from 09/01/97 to 22/12/97
E3218A



pH

IDENTIFICATION:

Laboratory	Water Chemistry	Method Introduced	01/05/79
Method Reference No	E3248A	Reporting Units	Dimensionless
LIMS Product Code	PHACD3248,PH3248	Supervisor	J McBride
Sample Type/Matrix	Effluent, Industrial Waste, Raw Sewage, Drinking Water, Leachate, Precipitation, Surface Water		

SAMPLING:

Quantity Required	15 mL
Container	Glass or Plastic

ANALYTICAL PROCEDURE:

pH is directly measured on a stirred sample (15.0 mL) at room temperature. Stirring rate, tube size, degree of electrode immersion, and room temperature range are uniform for all samples and standards. Total fixed endpoint acidity and Gran acidity can be determined simultaneously if the sample volume exceeds 50 mL .

INSTRUMENTATION:

Automated modular titration system with microcomputer control and data processing software.

REPORTING:

Maximum Significant Figures: 3

CALIBRATION:

2 standard buffers covering the pH range of 4 to 9

CONTROLS:

Calibration	LTBL plus 2 standards, e.g. QCA
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NOTES:

A new automated system was introduced in Sept' 96.

pH (E3248A)

QUALITY CONTROL DATA FROM 21/01/97 TO 30/10/98

Analytical Range: to 14.00 Dimensionless

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	38	4.45	4.426	-0.024	0.0458
B:	38	3.75	3.715	-0.035	0.0545
A+B:	38	8.20	8.141	-0.059	0.0973
A-B:	38	0.70	0.711	0.011	0.0259

s.d.(AB) S(between runs): 0.040 S/Sw:(within run): 0.041 S/Sw: 1.0

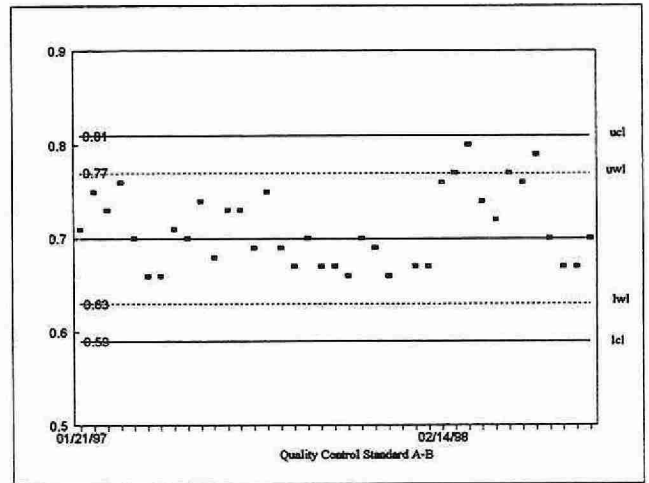
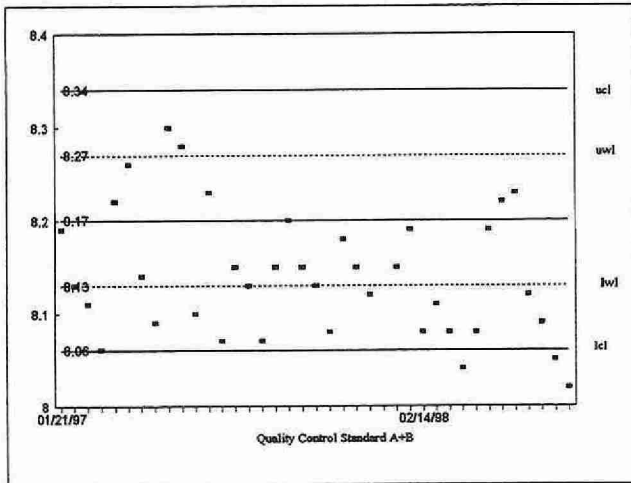
On any given day the calibration is accepted if the values obtained lie within the ranges:

8.06 - 8.34 for A+B
0.59 - 0.81 for A-B

DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
7	2.50 - 4.00	0.0100	0.2
70	4.01 - 5.00	0.0140	0.4
11	5.01 - 8.00	0.0377	0.7
88	Overall	0.0156	

pH
Quality Control Data From 21/01/97 To 30/10/98
E3248A



pH

IDENTIFICATION:

Laboratory	Water Chemistry	Method Introduced	09/07/80
Method Reference No.	E3289A	Reporting Unit	Dimensionless
LIMS Product Code	PHALCO3289, CONDPH3289	Supervisor	J. McBride
Sample Type/Matrix	Precipitation, Surface Water		

SAMPLING:

Quantity Required	50 mL
Container	Glass or Plastic

ANALYTICAL PROCEDURE:

pH is directly measured on a stirred sample (10.0 mL) at room temperature. Stirring rate, tube size, degree of electrode immersion, and room temperature range are uniform for all samples and standards. Total fixed endpoint alkalinity, and conductivity are determined simultaneously.

INSTRUMENTATION:

Automated modular titration system with microcomputer control and data processing software.

REPORTING:

Maximum Significant Figures: 3

CALIBRATION:

2 standard buffers covering the pH range of 4 to 9

CONTROLS:

Calibration	2 QC standards e.g. QCA
Drift	In run standards throughout the run (diluted tap water 20% V/V)

pH (E3289A)

QUALITY CONTROL DATA FROM 08/01/97 TO 18/12/97

Analytical Range: to 14.00 Dimensionless

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	56	7.41	7.43	0.02	0.0320
B:	56	4.45	4.54	0.09	0.0804
A+B:	56	11.86	11.97	0.11	0.0824
A-B:	56	2.96	2.89	-0.07	0.0905

s.d.(AB) S(between runs): 0.06 S/Sw:(within run): 0.06 S/Sw: 1.0

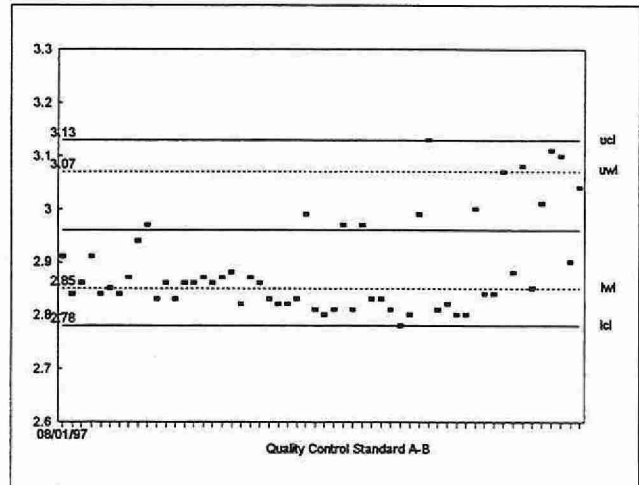
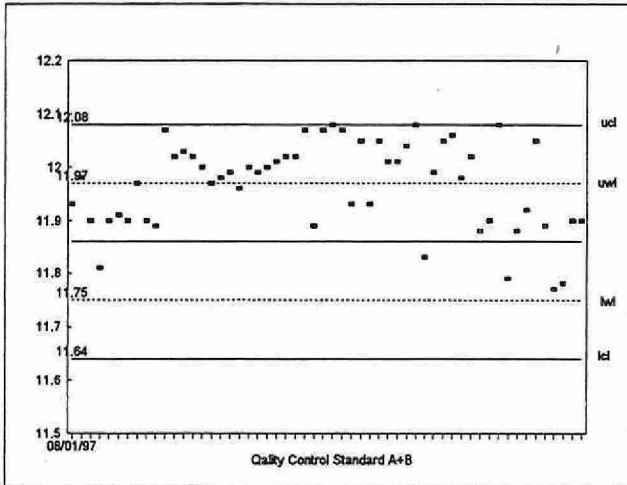
On any given day the calibration is accepted if the values obtained lie within the ranges:

11.64 - 12.08 for A+B
2.79 - 3.13 for A-B

DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
12	4.00 - 7.50	0.0957	1.3
48	7.51 - 8.00	0.0893	1.1
86	8.01 - 9.00	0.0619	0.8
146	Overall	0.0750	

pH
Quality Control Data from 08/01/97 to 18/12/97
E3289A



PHENOLICS, REACTIVE

IDENTIFICATION:

Laboratory	Water Chemistry	Method Introduced	01/04/74
Method Reference No.	E3179A	Reporting Unit	µg/L as Phenol
LIMS Product Code	PHEN3179	Supervisor	J. McBride
Sample Type/Matrix	Ground Water, Surface Water, Effluent, Drinking Water, Leachate, Raw Sewage, Industrial Waste, Process Water, Precipitation		

SAMPLING:

Quantity Required	250 mL
Container	Glass, (Phenol bottle with white cap containing preservative is available)
Preservative	Sulfuric acid to pH 1.5 - 2

ANALYTICAL PROCEDURE:

Samples are automatically distilled from an acid media, and reactive phenolics in the distillate are determined colourimetrically by formation of an antipyrene dye through reactions with 4-aminoantipyrene and potassium ferricyanide.

Approximate absorbance: 0.03 at the full scale level.

INSTRUMENTATION:

Basic automated modular continuous flow system plus a distillation module. Colourimetric measurement is through a 5.0 cm. light path at 505 nm.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.2	Current T value: 1
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CALIBRATION:

BL plus 2 standards

CONTROLS:

Calibration	LTBL plus 2 standards, e.g. QCA (see note)
Drift	BL, standard, BL every 10 samples

NOTES:

An additional Quality Control Standard (QCC) was added to the method in March 1997.

PHENOLICS, REACTIVE (E3179A)

QUALITY CONTROL DATA FROM 03/01/97 TO 19/12/97

Full Scale: to 50.0 µg/L as Phenol

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	41	40	40.05	0.05	0.5259
B:	41	10	10.28	0.28	0.2208
C:	32	5	5.20	0.20	0.1685
A+B:	41	50	50.33	0.33	0.6068
A-B:	41	30	29.78	-0.22	0.5314
B+C:	41	15	15.51	0.51	0.2855
B-C:	32	5	5.11	0.11	0.2006

s.d.(AB) S(between runs):0.40

Sw(within run): 0.38

S/Sw: 1.07

s.d.(BC) S(between runs):0.20

Sw(within run): 0.14

S/Sw: 1.38

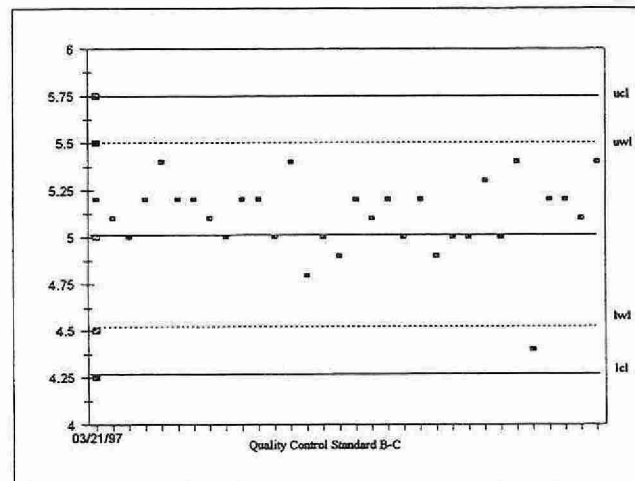
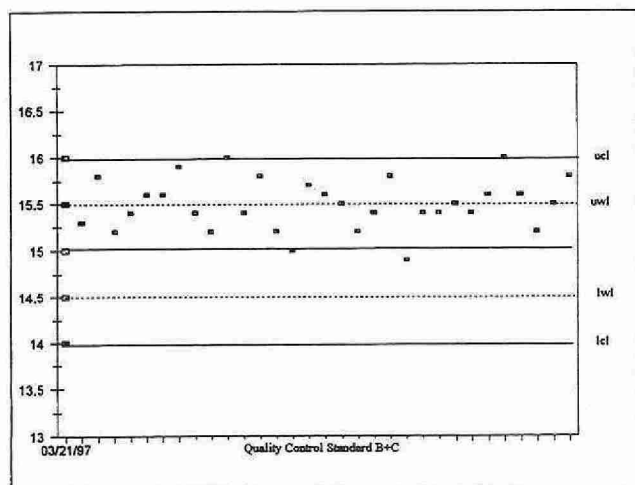
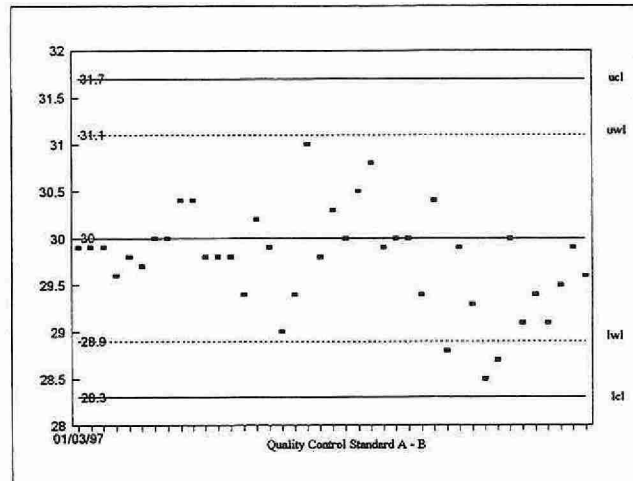
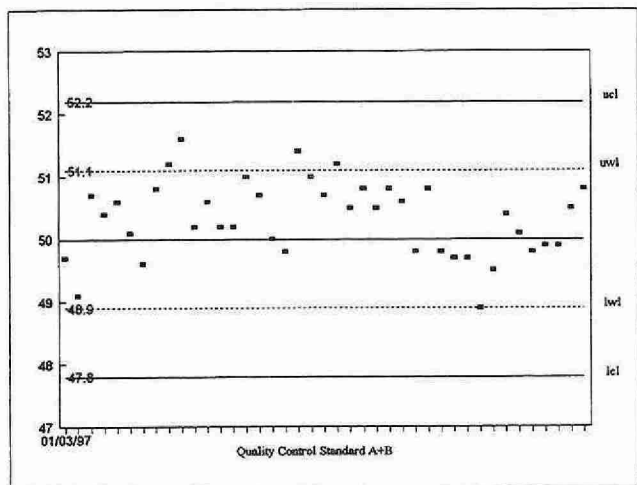
On any given day the calibration is accepted if the calibration control values obtained lie within the ranges:

47.8	-	52.2	for	A+B
28.3	-	31.7	for	A-B
14.0	-	16.0	for	B+C
4.25	-	5.75	for	B-C

DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
103	0.00 - 5.0	0.1215	23.3
2	5.1 - 10.0	N.A.	N.A.
3	10.1 - 25.0	0.1923	2.4
2	25.1 - 50.0	N.A.	N.A.
110	Overall	0.1274	

Phenolics, Reactive
Quality Control Data From 03/01/97 To 19/12/97
E3179A



PHOSPHORUS, REACTIVE ortho-PHOSPHATE

IDENTIFICATION:

Laboratory	Water Chemistry	Method Introduced	01/04/79
Method Reference No.	E3364A	Reporting Unit	mg/L as P
LIMS Product Code	DISNUT3364	Supervisor	J. McBride
Sample Type/Matrix	Dried Sludge, Sediment, Soil, Vegetation, Drinking Water, Ground Water, Surface Water		

SAMPLING:

Quantity Required	10 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

Ortho-phosphate is determined on the supernatant of a settled sample by formation of the reduced phospho-antimonyl-molybdate complex using ascorbic acid as the reducing agent.

Approximate absorbance: 0.2 at the full scale level.

Ammonia plus ammonium, nitrite, and nitrate plus nitrite are determined simultaneously.

INSTRUMENTATION:

Basic automated modular continuous flow system with colourimetric measurement through a 5.0 cm. light path at 880 nm using IR sensitive phototube.

Data capture, reduction, and processing via a multi-stage microcomputer system.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.0005	Current T value: 0.0025
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CALIBRATION:

BL plus 7 standards

CONTROLS:

Calibration	LTBL plus 3 standards, e.g. QCA
Drift	BL every 10 samples; standard every 20 samples

PHOSPHORUS, REACTIVE ortho-PHOSPHATE (E3364A)

QUALITY CONTROL DATA FROM 07/01/97 TO 23/12/97

Full Scale: to 0.100 mg/L as P

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	93	0.080	0.07991	-0.00009	0.0010
B:	93	0.040	0.0398	-0.0002	0.0010
C:	93	0.008	0.0079	-0.0001	0.0009
A+B:	93	0.120	0.1197	-0.0003	0.0014
A-B:	93	0.040	0.0399	0.0001	0.0013
B+C:	93	0.048	0.0476	-0.0004	0.0016
B-C:	93	0.032	0.0319	-0.0001	0.0010

s.d.(AB)	S(between runs):0.0009	Sw(within run): 0.0009	S/Sw: 1.0
s.d.(BC)	S(between runs):0.0009	Sw(within run): 0.0007	S/Sw: 1.3

The calibration is accepted if the calibration control values obtained lie within the ranges:

0.1152	-	0.1248	for	A+B
0.0364	-	0.0436	for	A-B
0.0448	-	0.0512	for	B+C
0.0296	-	0.0344	for	B-C

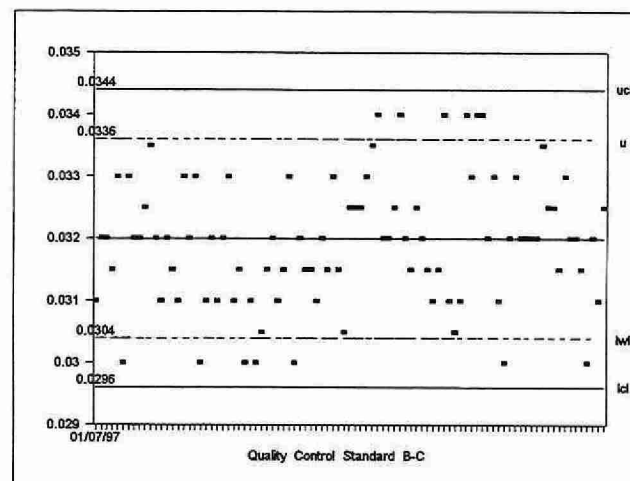
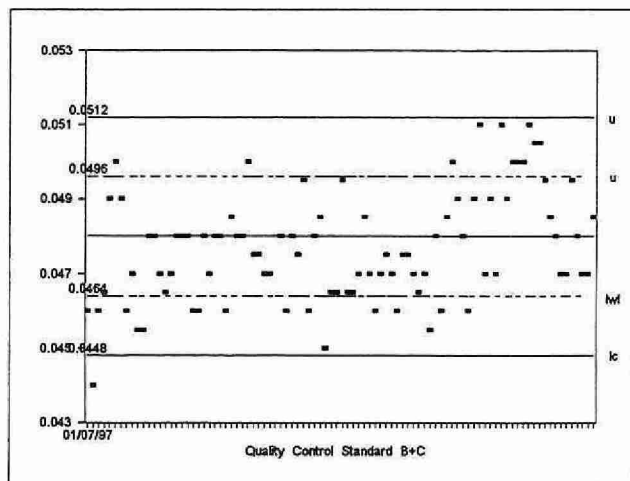
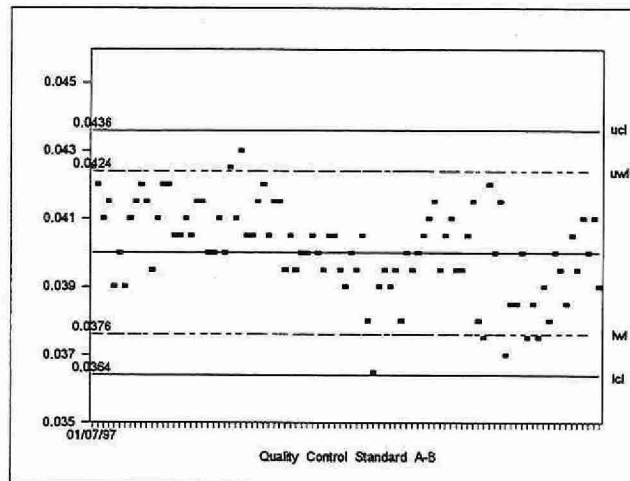
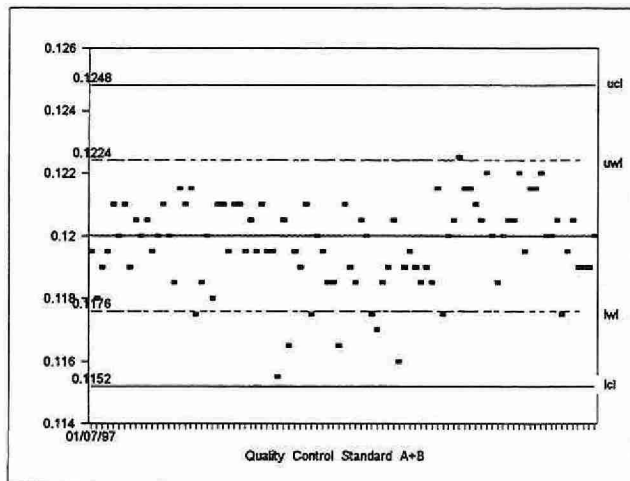
DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
185	0.000 - 0.010	0.00074	25.3
24	0.011 - 0.020	0.00099	6.6
25	0.021 - 0.050	0.00231	9.7
25	0.051 - 0.100	0.00168	2.4
259	Overall	0.00091	

OTHER CHECKS:

	n	Mean	Standard Deviation (1)
Long Term Blank	93	0.0007	0.0013

Phosphorus, Reactive ortho-Phosphate (mg/L as P)
 Quality Control Data From 07/01/97 to 23/12/97
 E3364A



PHOSPHORUS, REACTIVE ortho-PHOSPHATE

IDENTIFICATION:

Laboratory	Water Chemistry	Method Introduced	01/04/79
Method Reference No	E3366A	Reporting Unit	mg/L as P
LIMS Product Code	DISNUT3366	Supervisor	J. McBride
Sample Type/Matrix	Sludge, Effluent, Raw Sewage, Industrial Waste, Process Water, Leachate, Drinking Water, Ground Water		

SAMPLING:

Quantity Required	10 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

Ortho-phosphate is determined on the supernatant of a settled sample by formation of the reduced phospho-antimonyl-molybdate complex using ascorbic acid as the reducing agent.

Approximate absorbance: 0.5 at the full scale level.

Ammonia plus ammonium, nitrite, and nitrate plus nitrite are determined simultaneously.

INSTRUMENTATION:

Basic automated modular continuous flow system with colourimetric measurement through a 5.0 cm. light path at 880 nm using IR sensitive phototube.

Data capture, reduction, and processing via a multi-stage microcomputer system.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.02	Current T value: 0.1
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CALIBRATION:

BL plus 7 standards

CONTROLS:

Calibration	LTBL plus 3 standards, e.g. QCA
Drift	BL every 10 samples; standard every 20 samples

PHOSPHORUS, REACTIVE ortho-PHOSPHATE (E3366A)

QUALITY CONTROL DATA FROM 10/01/97 TO 22/12/97

Laboratory Unit: Colourimetry

Full Scale: to 10.0 mg/L as P

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	84	8.00	8.031	0.031	0.0738
B:	84	4.00	4.019	0.019	0.0422
C:	84	0.800	0.805	0.005	0.0251
A+B:	84	12.0	12.050	0.050	0.0898
A-B:	84	4.00	4.011	0.011	0.0798
B+C:	84	4.80	4.825	0.025	0.0582
B-C:	84	3.20	3.214	0.014	0.0378

s.d.(AB) S(between runs): 0.0601

Sw(within run): 0.0565

S/Sw: 1.1

s.d.(BC) S(between runs): 0.0347

Sw(within run): 0.0267

S/Sw: 1.3

The calibration is accepted if the calibration control values obtained lie within the ranges:

11.71	-	12.29	for	A+B
3.78	-	4.22	for	A-B
4.66	-	4.94	for	B+C
3.09	-	3.31	for	B-C

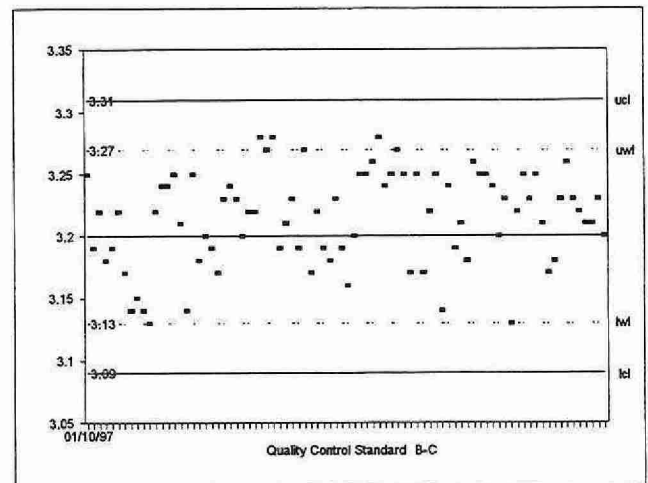
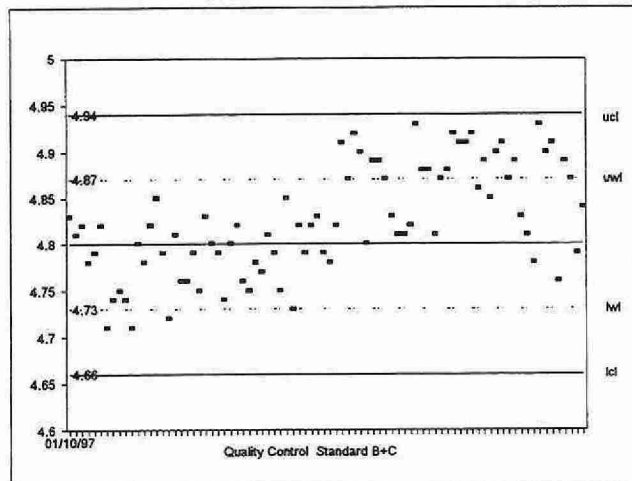
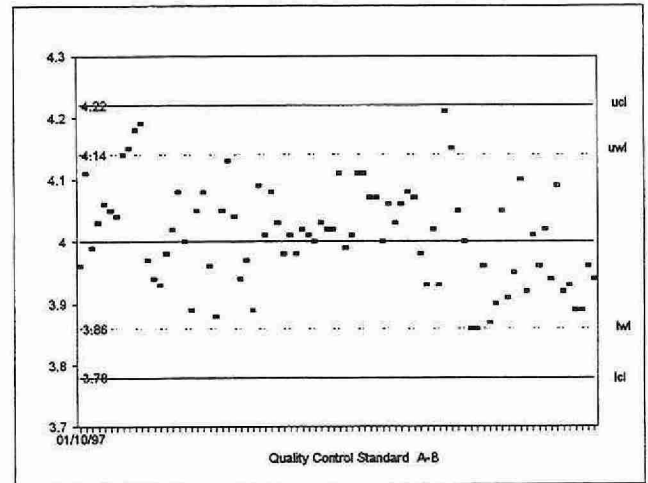
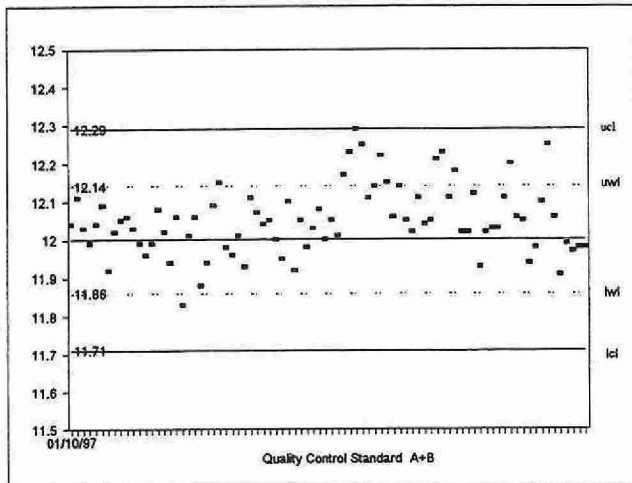
DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
181	0.000 - 1.00	0.0188	17.3
13	1.01 - 2.00	0.0532	2.5
24	2.01 - 5.00	0.0616	2.1
16	5.01 - 10.0	0.0910	13.2
234	Overall	0.0264	

OTHER CHECKS:

	n	Mean	Standard Deviation (1)
Long Term Blank	84	0.0339	0.0377

Phosphorous, Reactive ortho-Phosphate (mg/L as P)
Quality Control Data from 10/01/97 to 22/12/97
E3366A



PHOSPHORUS, TOTAL

IDENTIFICATION:

Laboratory	Dorset	Method Introduced	22/03/79
Method Reference No.	E3036A	Reporting Unit	$\mu\text{g/L}$ as P
LIMS Product Code	TP3036	Supervisor	F. Tomassini
Sample Type/Matrix	Leachate, Precipitation, Surface Water		

SAMPLING:

Quantity Required:	35 mL
Container:	Specially marked Pyrex culture tubes with Teflon-lined caps

ANALYTICAL PROCEDURE:

After withdrawal of excess volume, digestion reagent is added and samples are autoclaved in sulphuric acid-potassium persulphate media at 121°C for 60 min. The orthophosphate content of the digestate is determined colourimetrically by formation of the reduced phospho-antimonyl-molybdate complex using ascorbic acid as the reducing agent.

Approximate absorbance: 0.3 at the full scale level

INSTRUMENTATION:

Autoclave plus basic automated modular continuous flow system with colourimetric measurement through a 5.0 cm. light path at 880 nm using appropriate phototube. Two analytical ranges are obtained from the output of the colourimeter.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.2	Current T value: 1
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CALIBRATION:

BL plus 9 undigested standards

CONTROLS:

Calibration	LTBL plus 3 undigested standards, e.g. QCA
Drift	BL every 10 samples and BL plus 1 undigested standard every 20 samples
Recovery	3 digested BL plus 3 digested standards, e.g. R1

NOTES:

System is calibrated with undigested standards, but sample concentrations are adjusted to reflect day's value for digested blank.

PHOSPHORUS, TOTAL (E3036A)

QUALITY CONTROL DATA FROM 21/01/97 TO 23/12/97

Analytical Range: to 50 µg/L

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	28	45.0	45.2	0.2	1.1732
B:	28	13.5	13.4	-0.1	0.3819
C:	28	4.5	4.6	0.1	0.3938
A+B:	28	58.5	58.6	0.1	1.4537
A-B:	28	31.5	31.9	0.4	0.9650
B+C:	28	18.0	17.9	-0.1	0.6428
B-C:	28	9.0	8.8	-0.2	0.4344

s.d.(AB) S(between runs): 0.87 Sw(within run): 0.68 S/Sw: 1.3
s.d.(BC) S(between runs): 0.39 Sw(within run): 0.31 S/Sw: 1.3

On any given day the calibration is accepted if the calibration control values obtained lie within the ranges:

53.5 - 63.5 for A+B
27.5 - 35.5 for A-B
16.0 - 20.0 for B+C
7.5 - 10.5 for B-C

RECOVERIES:

Number of Data	Expected Concentration	Mean Concentration	Standard Deviation (1)
28	35	35.8	1.7524
28	14	14.4	0.7518
28	7	7.3	0.6151

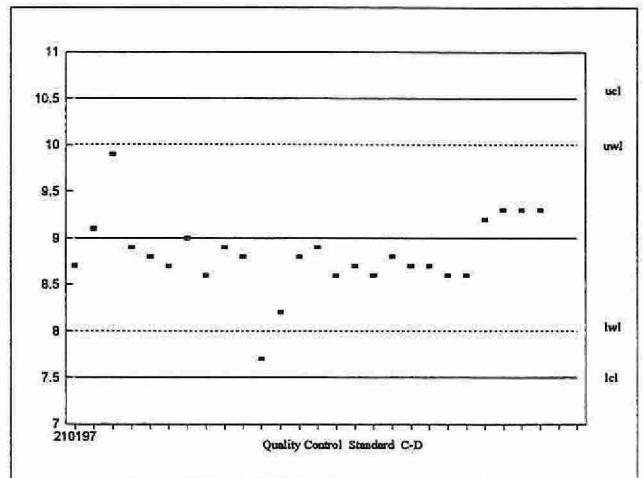
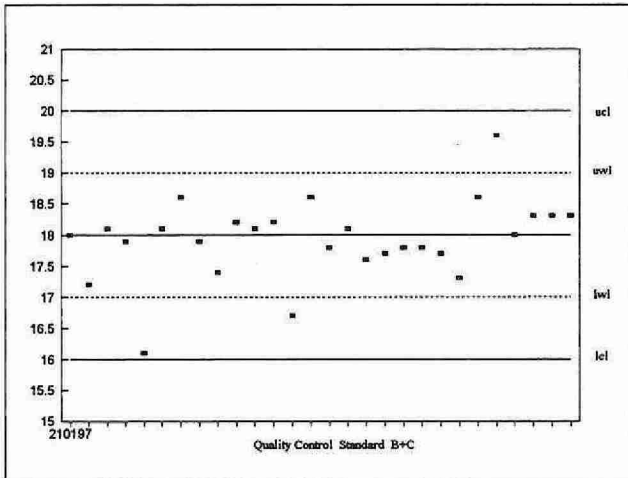
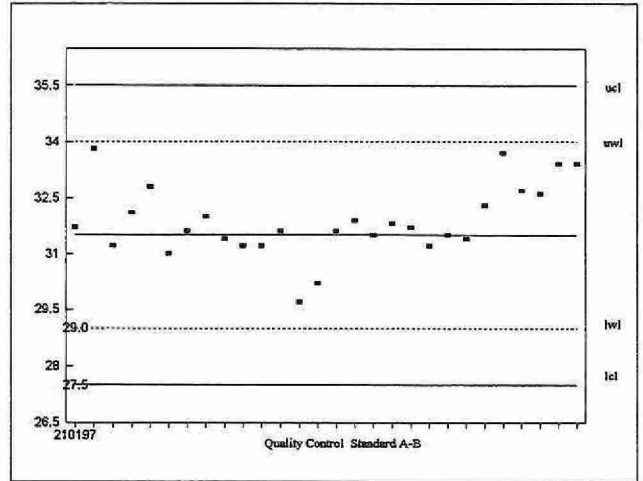
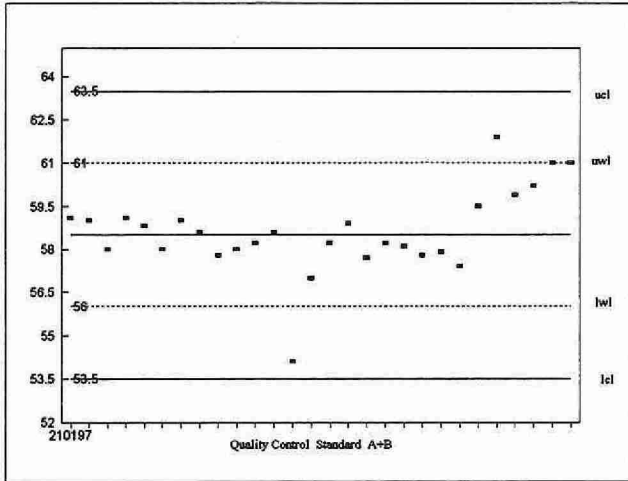
DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
43	0.0 - 10.0	0.3506	5.4
15	10.1 - 20.0	0.3894	5.8
13	20.1 - 50.0	0.9040	3.9
8	50.1 - 100.0	1.1030	2.1
79	Overall	0.3679	

OTHER CHECKS:

	n	Data Mean	Standard (1) Deviation
Long Term Blank	28	0.2643	0.3234
Digested Blank	28	1.3286	0.4920

Phosphorus, Total
Quality Control Data From 21/01/97 To 23/12/97
E3036A



PHOSPHORUS, TOTAL

IDENTIFICATION:

Laboratory	Water Chemistry	Method Introduced	Mar '89
Method Reference No.	E3116A	Reporting Unit	mg/g as P
LIMS Product Code	TNP3116	Supervisor	J. McBride
Sample Type/Matrix	Soil, Sediment, Dried Sludge		

SAMPLING:

Quantity Required	0.08 to 0.4 g
Container	Glass or plastic

ANALYTICAL PROCEDURE:

Phosphorus compounds are converted to simple inorganic forms by dissolution of the samples in hot sulphuric acid and potassium persulphate. Potassium persulphate is added later in the digestion to raise the boiling point and to provide a highly oxidizing environment to decompose the more resistant organic matter. The digestate is analyzed using an automated colourimetric system.

INSTRUMENTATION:

Hot plate

Basic automated modular continuous flow system : Colourimetric measurement is through a 5 cm. light path at 660 nm.

Data capture, and processing via a microcomputer system

REPORTING:

Maximum Significant Figures: 2 decimal places	Current W value: 0.02	Current T value: 0.10
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CALIBRATION:

3 High and 2 Low Calibration Standards

CONTROLS:

Calibration	In house composite B-Soil/sediment, plus QC Soils/Sediment (RS92)
Drift	4 BL's per run; high and low calibration standard at the end of the run
Recovery	1 digested BL plus 4 digested standards

NOTES:

System is calibrated with undigested standards.

PHOSPHORUS, TOTAL (E3116A)

QUALITY CONTROL DATA FROM 01/01/97 TO 24/11/98

Full Scale: 2 mg/g as P

CALIBRATION CONTROL:

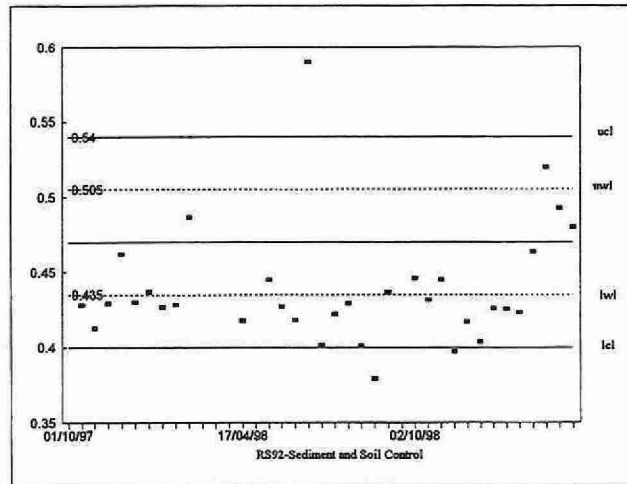
	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
RS92	34	0.47	0.44	-0.03	0.0422

The calibration is accepted if the calibration control values obtained lie within the ranges:
0.4 - 0.54 for RS92

DUPLICATES: (Sediment/Soils)

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
21	0.00 - 0.50	0.0724	20.0
36	0.51 - 1.00	0.1072	15.4
23	1.00 - 2.50	0.2964	17.2
7	2.51 - 5.00	0.0769	2.1
87	Overall	0.1724	

Phosphorus, Total (mg/g as P)
Quality Control Data From 10/01/97 To 24/11/98
E3116A



PHOSPHORUS, TOTAL

IDENTIFICATION:

Laboratory	Water Chemistry	Method Introduced	Mar '89
Method Reference No.	E3118A	Reporting Unit	mg/g as P
LIMS Product Code	TNP3118	Supervisor	J. McBride
Sample Type/Matrix	Vegetation, Moss Bag		

SAMPLING:

Quantity Required	0.02 to 0.04 g
Container	Glass or plastic

ANALYTICAL PROCEDURE:

Phosphorus compounds are converted to simple inorganic forms by dissolution of the samples in hot sulphuric acid and potassium persulphate. Potassium persulphate is added later in the digestion to raise the boiling point and to provide a highly oxidizing environment to decompose the more resistant organic matter. The digestate is analyzed using an automated colourimetric system.

INSTRUMENTATION:

Hot plate.

Basic automated modular continuous flow system : Colourimetric measurement is through a 5 cm. light path at 660 nm.

Data capture, and processing via a microcomputer system.

REPORTING:

Maximum Significant Figures: 2 decimal places	Current W value: 0.02	Current T value: 0.10
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CALIBRATION:

3 High and 2 Low Calibration Standards

CONTROLS:

Calibration	In house composite A-VEG, plus QC VEG (Pine Needles)
Drift	4 BL's per run; high and low calibration standard at the end of the run
Recovery	1 digested BL plus 4 digested standards

NOTES:

System is calibrated with undigested standards.

PHOSPHORUS, TOTAL (E3118A)

QUALITY CONTROL DATA FROM 01/01/97 TO 01/12/98

Full Scale: 5 mg/g as P

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
Pine Needles	4	1.2	1.3	0.1	0.1510

The calibration is accepted if the calibration control values obtained lie within the ranges:
1.0 - 1.4 for pine needles

DUPLICATES: (Sediment/Soils)

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
0	0.00 - 0.50	N.A.	N.A.
8	0.51 - 2.50	0.1561	8.9
7	2.51 - 5.00	0.1654	4.3
15	Overall	0.1605	

PHOSPHORUS, TOTAL

IDENTIFICATION:

Laboratory	Water Chemistry	Method Introduced	01/04/79
Method Reference No	E3367A	Reporting Unit	mg/L as P
LIMS Product Code	TOTNUT3367	Supervisor	J. McBride
Sample Type/Matrix	Precipitation, Drinking Water, Ground Water , Surface Water		

SAMPLING:

Quantity Required	50 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

Samples are digested in a sulphuric acid-mercuric oxide-potassium sulphate media using three block digesters kept at 180°C, 210°C and 360°C. The pH of the digestate is adjusted in-line and then orthophosphate is determined by formation of the reduced phospho-antimonyl-molybdate complex using ascorbic acid as the reducing agent.

Approximate absorbance: 0.4 at the full scale level.

Total Kjeldahl nitrogen is determined simultaneously.

INSTRUMENTATION:

Three Block digesters

Basic automated modular continuous flow system with colourimetric measurement through a 5.0 cm. light path at 880 nm using appropriate phototube.

Data capture, reduction, and processing via a multi-stage microcomputer system

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.002	Current T value: 0.01
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CALIBRATION:

BL plus 7 undigested standards

CONTROLS:

Calibration	LTBL plus 3 undigested standards, e.g. QCA
Drift	BL every 10 samples; undigested standard every 20 samples
Recovery	3 digested BL plus 3 digested standards in duplicate, e.g. R1

PHOSPHORUS, TOTAL (E3367A)

QUALITY CONTROL DATA FROM 10/01/97 TO 18/12/97

Full Scale: to 0.200 mg/L as P

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	98	0.160	0.1606	0.0006	0.0013
B:	98	0.080	0.0800	0.0000	0.0008
C:	98	0.016	0.0160	0.0000	0.0005
A+B:	98	0.240	0.2407	0.0007	0.0015
A-B:	98	0.080	0.0805	0.0005	0.0015
B+C:	98	0.096	0.0962	0.0002	0.0010
B-C:	98	0.064	0.0641	0.0001	0.0009

98

s.d.(AB)	S(between runs):	0.000001	Sw(within run):	0.000001	S/Sw: 1.0
s.d.(BC)	S(between runs):	0.000000	Sw(within run):	0.000000	S/Sw: 1.0

The calibration is accepted if the calibration control values obtained lie within the ranges:

0.2332	-	0.2468	for	A+B
0.0749	-	0.0851	for	A-B
0.092	-	0.100	for	B+C
0.061	-	0.067	for	B-C

RECOVERIES:

Number of Data	Expected Concentration	Mean Concentration	Standard Deviation (1)
98	0.140	0.1334	0.0260
98	0.084	0.0837	0.0027
98	0.028	0.0280	0.0018

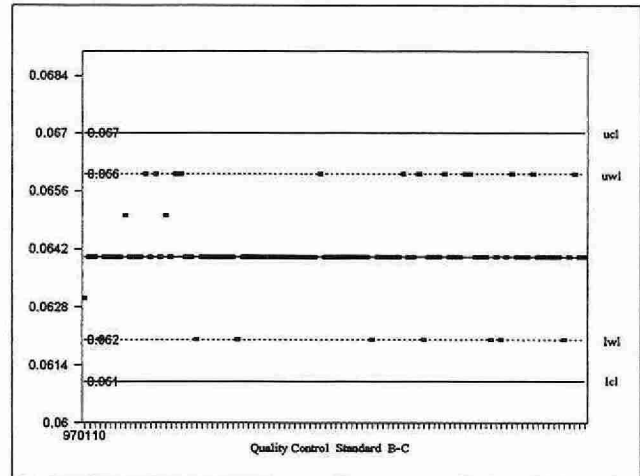
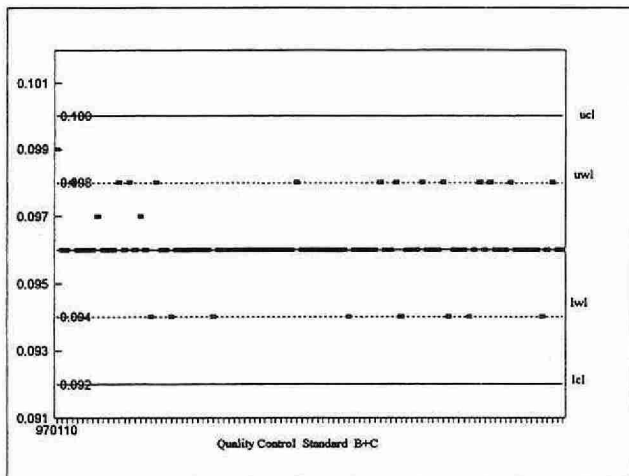
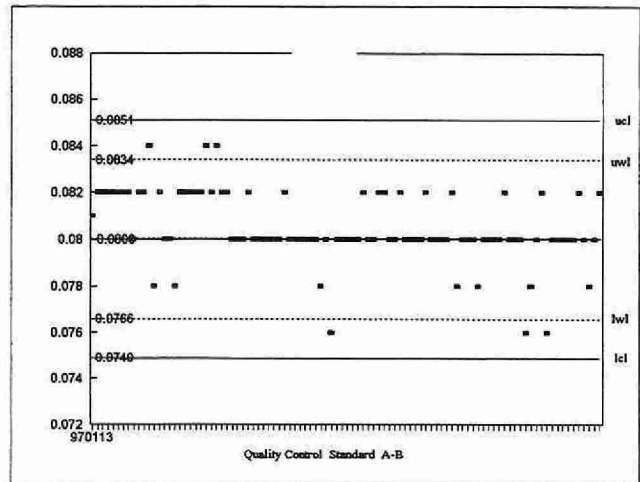
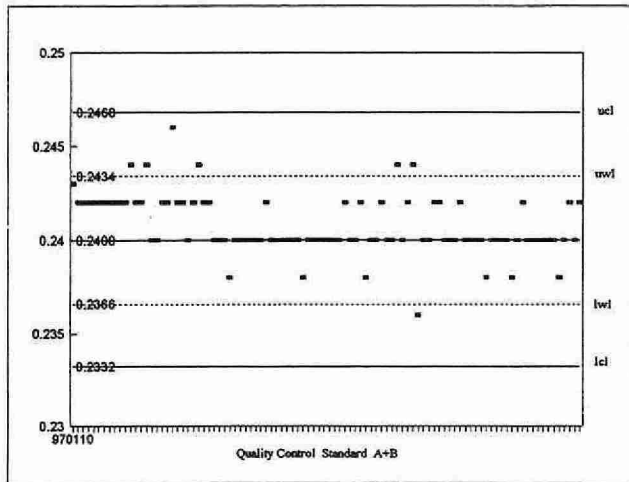
DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
190	0.000 - 0.020	0.0022	26.0
58	0.021 - 0.040	0.0021	11.1
19	0.041 - 0.100	0.0036	9.4
8	0.101 - 0.200	0.0083	3.4
275	Overall	0.0020	

OTHER CHECKS:

	n	Mean	Standard Deviation (1)
Long Term Blank	98	0.0004	0.0009
Digested Blank	98	0.0012	0.0012

Phosphorous, Total (mg/L as P)
Quality Control Data From 10/01/97 to 18/12/1997
E3367A



PHOSPHORUS, TOTAL

IDENTIFICATION:

Laboratory	Water Chemistry	Method Introduced	01/04/79
Method Reference No.	E3368A	Reporting Unit	mg/L as P
LIMS Product Code	TOTNUT3368	Supervisor	J. McBride
Sample Type/Matrix	Sludge, Raw Sewage, Industrial Waste, Drinking Water, Effluent, Ground Water, Process Water, Leachate		

SAMPLING:

Quantity Required	50 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

Samples are digested in a sulphuric acid-mercuric oxide-potassium sulphate media using three block digestors kept at 180°C, 210°C and 360°C. The pH of the digestate is adjusted in-line and then orthophosphate is determined by formation of the reduced phospho-antimonyl-molybdate complex using ascorbic acid as the reducing agent.

Approximate absorbance: 0.8 at the full scale level.

Total Kjeldahl Nitrogen is determined simultaneously.

INSTRUMENTATION:

3-Block digesters

Basic automated modular continuous flow system with colourimetric measurement through a 5.0 cm. light path at 880 nm using an IR sensitive phototube. Data capture, reduction, and processing via a multi-stage microcomputer system.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.02	Current T value: 0.10
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CALIBRATION:

BL plus 7 standards

CONTROLS:

Calibration	LTBL plus 3 standards, e.g. QCA
Drift	BL every 10 samples; undigested standard every 20 samples
Recovery	3 digested BL plus 3 digested standards in duplicate, e.g. R1

NOTES:

System is calibrated with undigested standards.

PHOSPHORUS, TOTAL (E3368A)

QUALITY CONTROL DATA FROM 06/01/97 TO 16/12/97

Full Scale: to 10.0 mg/L as P

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	52	8.0	8.021	0.021	0.0332
B:	52	4.0	4.010	0.010	0.0208
C:	52	0.8	0.804	0.004	0.0121
A+B:	52	12.0	12.031	0.031	0.0421
A-B:	52	4.0	4.010	0.010	0.0359
B+C:	52	4.8	4.815	0.015	0.0248
B-C:	52	3.2	3.206	0.006	0.0233

s.d. (AB) S(between runs): 0.0008 Sw(within run): 0.0006 S/Sw: 1.2
s.d. (BC) S(between runs): 0.0003 Sw(within run): 0.0003 S/Sw: 1.1

The calibration is accepted if the calibration control values obtained lie within the ranges:

11.87 - 12.13 for A+B
3.903 - 4.097 for A-B
4.732 - 4.868 for B+C
3.149 - 3.251 for B-C

RECOVERIES:

Number of Data	Expected Concentration	Mean Concentration	Standard Deviation (1)
52	7	6.92	0.1623
52	4.2	4.15	0.1240
52	1.4	1.39	0.0419

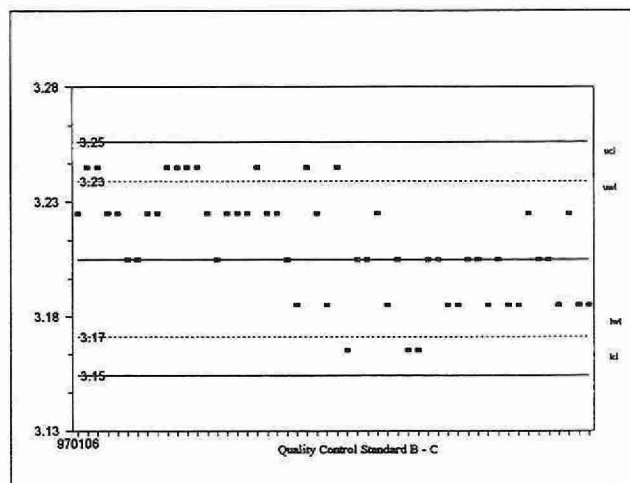
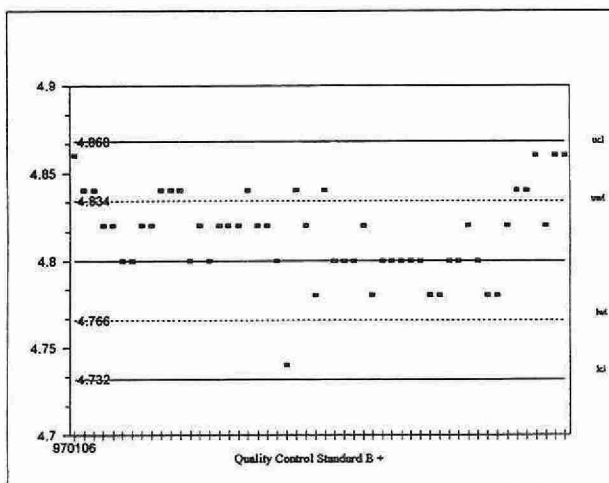
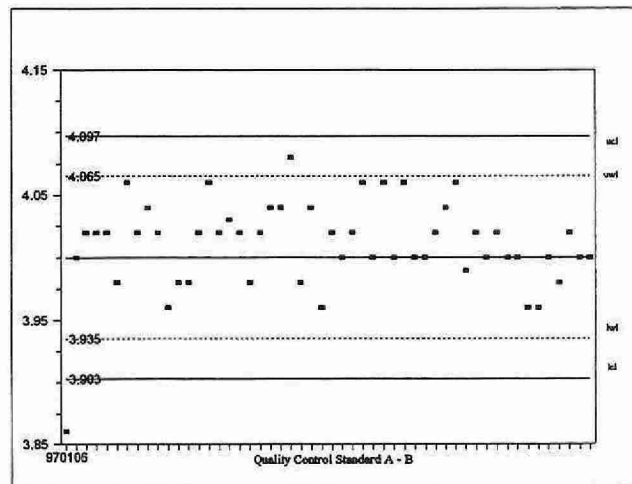
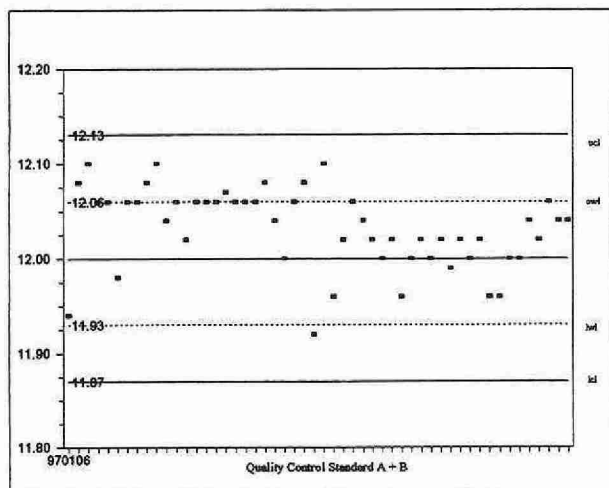
DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
61	0.00 - 1.00	0.0382	19.6
25	1.00 - 2.00	0.0795	9.9
28	2.00 - 5.00	0.0737	5.1
4	5.00 - 10.00	0.0862	7.2
118	Overall	0.0348	

OTHER CHECKS:

	n	Mean	Standard Deviation (1)
Long Term Blank	52	0.009	0.0300
Digested Blank	52	0.014	0.0196

Phosphorous, Total (mg/L as P)
Quality Control Data from 06/01/1997 to 16/12/1997
E3368A



POTASSIUM

IDENTIFICATION:

Laboratory	Dorset	Method Introduced	20/07/88
Method Reference No.	E3249A	Reporting Unit	mg/L as K
LIMS Product Code	CAT3249	Supervisor	F. Tomassini
Sample Type/Matrix	Leachate, Precipitation, Surface Water		

SAMPLING:

Quantity Required	5 mL
Container	Plastic

ANALYTICAL PROCEDURE:

Samples are analyzed by AAS at 766.5 nm with an air-acetylene flame. Cesium chloride is added as a suppressant via an automated sampling train.

Approximate absorbance: 0.5 at the full scale level.

INSTRUMENTATION:

Automated modular atomic absorption spectrophotometer (AAS) system.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.005	Current T value: 0.025
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CALIBRATION:

BL plus 5 standards

CONTROLS:

Calibration	LTBL plus 3 standards, e.g., QCA
Drift	BL, reslope standard every 10 samples.

NOTES:

The control standards are corrected for the LTB from which they were made.

POTASSIUM (E3249A)

QUALITY CONTROL DATA FROM 14/01/97 TO 23/12/97

Full Scale: to 1.0 mg/L as K

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	42	0.80	0.7973	-0.0027	0.0102
B:	42	0.20	0.1957	-0.0043	0.0070
C:	42	0.05	0.0500	0.0000	0.0032
A+B:	42	1.00	0.9930	-0.0070	0.0161
A-B:	42	0.60	0.6016	0.0016	0.0085
B+C:	42	0.25	0.2457	-0.0043	0.0087
B-C:	42	0.15	0.1457	-0.0043	0.0071

s.d.(AB) S(between runs): 0.009 Sw(within run): 0.006 S/Sw: 1.5
s.d.(BC) S(between runs): 0.006 Sw(within run): 0.005 S/Sw: 1.1

The calibration is accepted if the calibration control values obtained lie within the ranges:

0.973 - 1.027 for A+B
0.580 - 0.620 for A-B
0.228 - 0.272 for B+C
0.134 - 0.166 for B-C

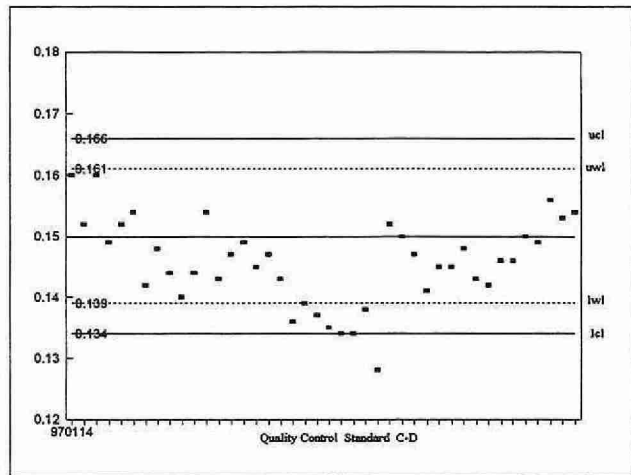
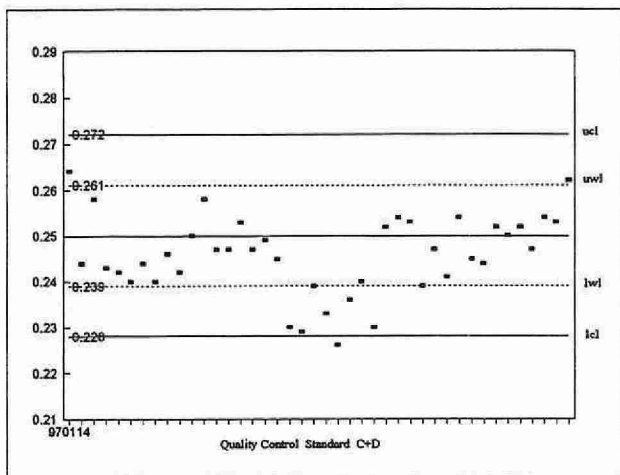
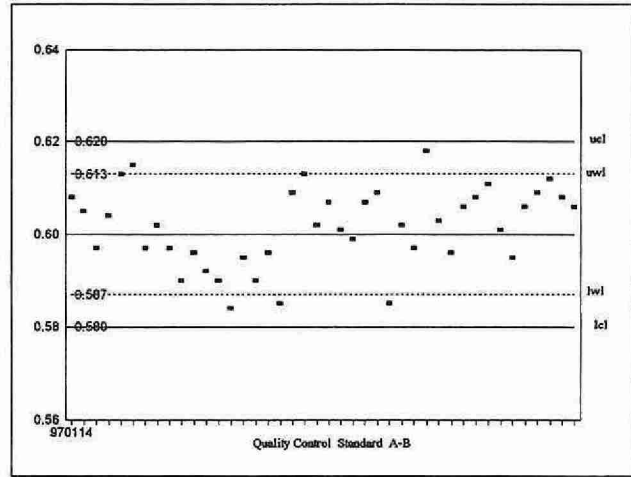
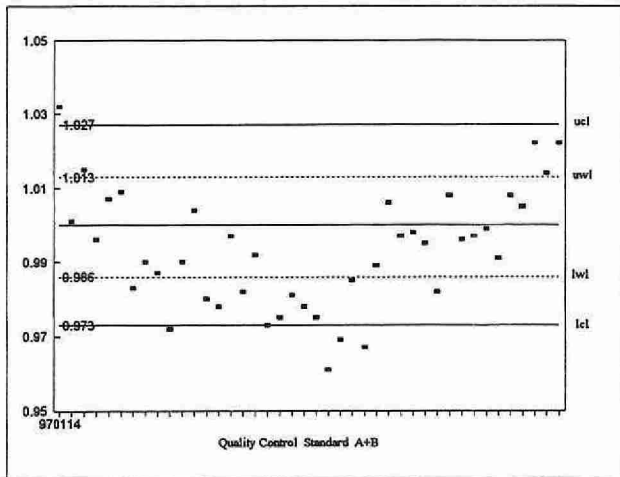
DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
29	0.00 - 0.10	0.0014	4.6
16	0.11 - 0.20	0.0030	2.6
16	0.21 - 0.50	0.0079	1.6
17	0.51 - 1.00	0.0069	8.0
78	Overall	0.0041	

OTHER CHECKS:

	n	Mean	Standard Deviation (1)
Long Term Blank	42	0.0002	0.0030

Potassium (mg/L as K)
 Quality Control Data From 14/01/97 To 23/12/97
 E3249A



SILICON, REACTIVE SILICATES

IDENTIFICATION:

Laboratory	Water Chemistry	Method Introduced	01/02/75
Method Reference No.	E3370A	Reporting Unit	mg/L as Si
LIMS Product Code	DCSI3370	Supervisor	J. McBride
Sample Type/Matrix	Effluent, Industrial Waste, Process Water, Raw Sewage, Drinking Water Ground Water, Leachates, Precipitation, Surface Water		

SAMPLING:

Quantity Required	10 mL
Container	Plastic

ANALYTICAL PROCEDURE:

Reactive silicates are determined by formation of a reduced molybdo-silicate complex at pH 1.6, using ascorbic acid as the reducing agent, and oxalic acid to suppress phosphate interference.

Approximate absorbance: 0.7 at the full scale level.

Dissolved inorganic and dissolved organic carbon are determined simultaneously.

INSTRUMENTATION:

Basic automated modular continuous flow system with colourimetric measurement through a 5.0 cm. light path at 660 nm. Data capture, reduction, and processing via a multi-stage microcomputer system.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.02	Current T value: 0.10
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CALIBRATION:

BL plus 7 standards

CONTROLS:

Calibration	LTBL plus 3 standards, e.g., QCA
Drift	BL every 10 samples; standard every 20 samples.

SILICON, REACTIVE SILICATES (E3370A)

QUALITY CONTROL DATA FROM 08/01/97 TO 23/12/97

Full Scale: to 10.0 mg/L as Si

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	58	8.00	7.989	-0.011	0.0268
B:	58	2.00	1.990	-0.010	0.0177
C:	58	0.50	0.495	-0.005	0.0101
A+B:	58	10.00	9.980	-0.020	0.0411
A-B:	58	6.00	5.999	-0.001	0.0193
B+C:	58	2.50	2.485	-0.014	0.0253
B-C:	58	1.50	1.495	-0.005	0.0137

s.d.(AB) S(between runs): 0.023

Sw(within run): 0.014

S/Sw: 1.7

s.d.(BC) S(between runs): 0.014

Sw(within run): 0.010

S/Sw: 1.5

The calibration is accepted if the calibration control values obtained lie within the ranges:

9.66	-	10.34	for	A+B
5.75	-	6.25	for	A-B
2.37	-	2.63	for	B+C
1.40	-	1.60	for	B-C

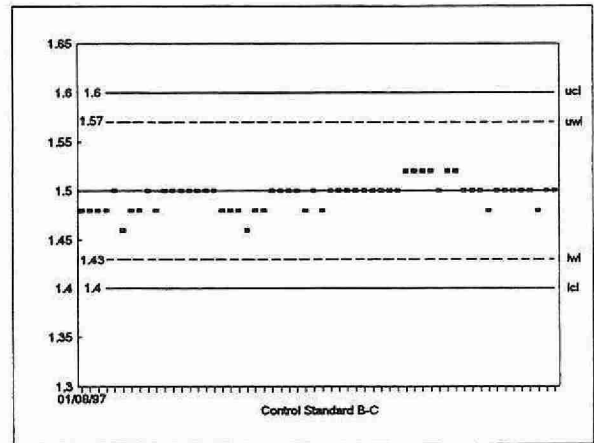
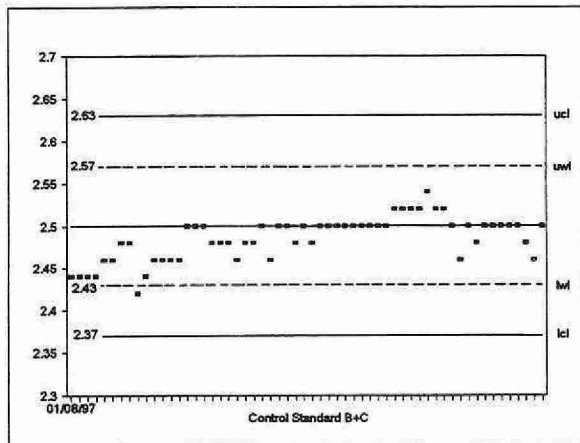
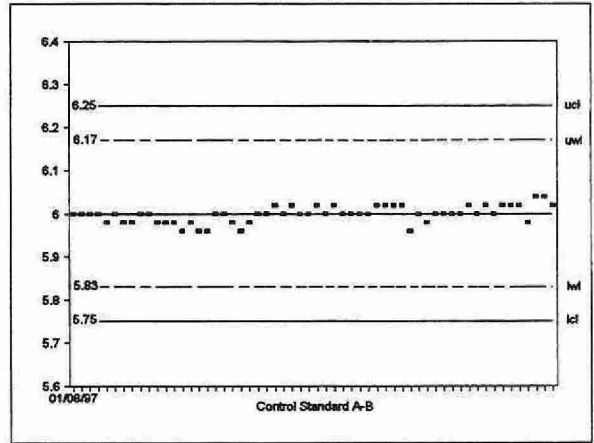
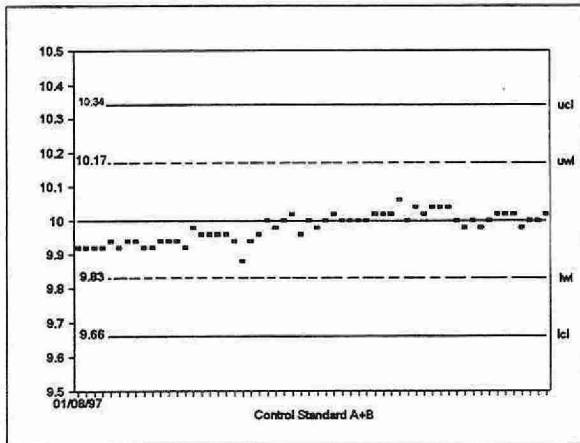
DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
78	0.00 - 1.00	0.0088	2.3
34	1.01 - 2.00	0.0087	0.6
43	2.01 - 5.00	0.0161	0.5
8	5.01 - 10.0	0.0245	0.4
163	Overall	0.0123	

OTHER CHECKS:

	n	Mean	Standard Deviation (1)
Long Term Blank	58	-0.0055	0.0105

Silicon, Reactive Silicates
Quality Control Data From 08/01/97 To 23/01/97
E3370A



SODIUM

IDENTIFICATION:

Laboratory Unit	Dorset	Method Introduced	20/07/88
Method Reference No.	E3249A	Reporting Unit	mg/L as Na
LIMS Product Code	CAT3249	Supervisor	F. Tomassini
Sample Type/Matrix	Leachate, Precipitation, Surface Water		

SAMPLING:

Quantity Required	5 mL
Container	Plastic

ANALYTICAL PROCEDURE:

Samples are analyzed by AAS at 589.0 nm with an air-acetylene flame. Cesium chloride is added as a suppressant via an automated sampling train.

Approximate absorbance: 0.5 at the full scale level.

INSTRUMENTATION:

Automated modular atomic absorption spectrophotometer (AAS) system.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.005	Current T value: 0.025
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CALIBRATION:

BL plus 5 standards

CONTROLS:

Calibration	LTBL plus 3 standards, e.g., QCA
Drift	BL, reslope standard every 10 samples.

NOTES:

The control standards are corrected for the LTB from which they were made.

SODIUM (E3249A)

QUALITY CONTROL DATA FROM 14/01/97 TO 23/12/97

Full Scale: to 4.0 mg/L as Na

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	42	3.2	3.207	0.007	0.0213
B:	42	0.8	0.804	0.004	0.0076
C:	42	0.2	0.205	0.005	0.0060
A+B:	42	4.0	4.010	0.010	0.0270
A-B:	42	2.4	2.403	0.003	0.0177
B+C:	42	1.0	1.007	0.007	0.0150
B-C:	42	0.6	0.599	-0.001	0.0080

s.d.(AB) S(between runs): 0.016

Sw(within run): 0.013

S/Sw: 1.3

s.d.(BC) S(between runs): 0.008

Sw(within run): 0.006

S/Sw: 1.4

The calibration is accepted if the calibration control values obtained lie within the ranges:

3.91 - 4.09 for A+B
2.33 - 2.47 for A-B
0.958 - 1.042 for B+C
0.568 - 0.632 for B-C

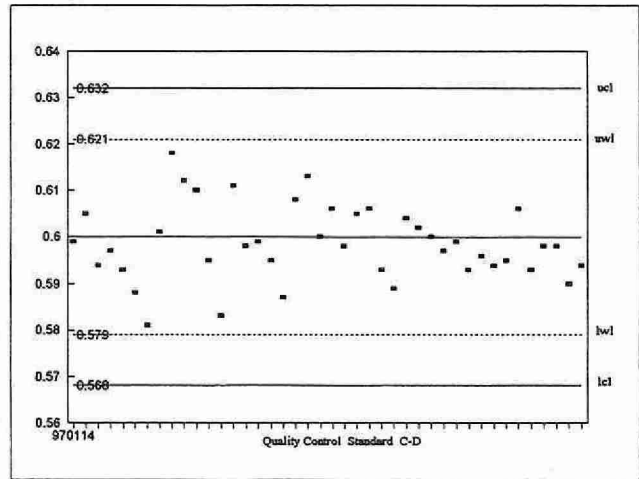
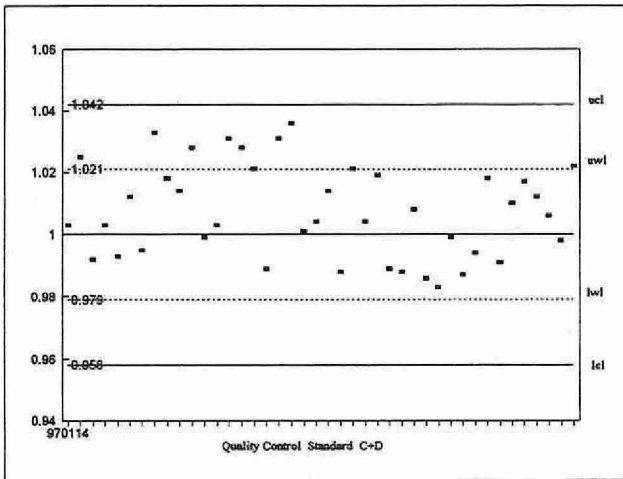
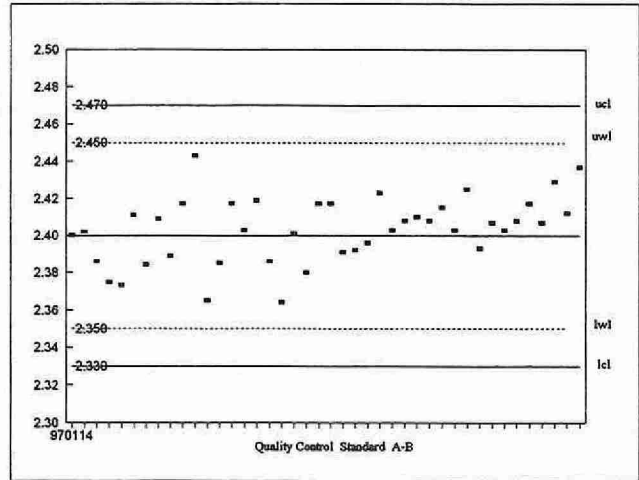
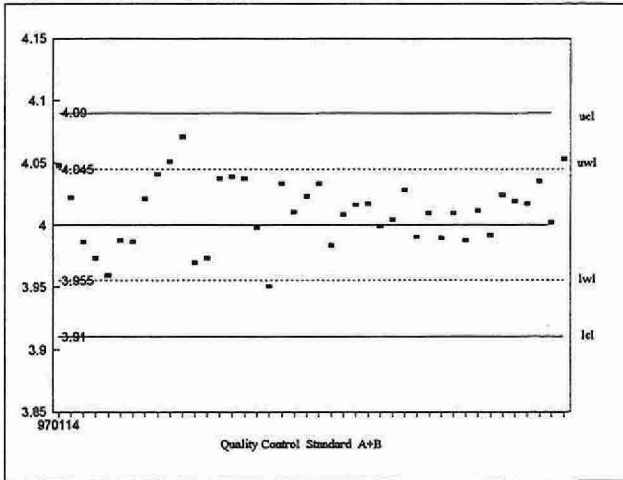
DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
40	0.00 - 0.40	0.0026	5.6
59	0.41 - 0.80	0.0079	1.5
39	0.81 - 2.00	0.0111	1.5
15	2.01 - 4.00	0.0305	0.1
153	Overall	0.0084	

OTHER CHECKS:

	n	Mean	Standard Deviation (1)
Long Term Blank	42	-0.0030	0.0063

Sodium (mg/L as Na)
Quality Control Data From 14/01/97 To 23/12/97
E3249A



SOLIDS, DISSOLVED

IDENTIFICATION:

Laboratory	Water Chemistry	Method Introduced	Before '61
Method Reference No.	E3188B	Reporting Unit	mg/L
LIMS Product Code	TSD3188,DS3188,DIGN3188	Supervisor	J. McBride
Sample Type/Matrix	Sludge, Effluent, Raw Sewage, Industrial Waste, Process Water, Surface Water, Drinking Water, Ground Water, Leachate		

SAMPLING:

Quantity Required	125 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

Sample is filtered under moderate suction through a Whatman 934AH grade glass fibre filter. Generally 100 mL of filtrate (alternate 50 mL) is pipetted into a preweighed Teflon dish, dried at $103 \pm 2^{\circ}\text{C}$, and stored in a desiccator for at least 24 hours. The dissolved solids content is calculated by subtracting the original dish mass from the dried residue + dish mass. Data collection, calculations, and transfer of results to LIMS are controlled by a microcomputer system.

INSTRUMENTATION:

Balance (5 decimal places), drying oven, suction filtration apparatus, dishes (Teflon).
Microcomputer system with appropriate software.

REPORTING:

Maximum Significant Figures: 3	Current W value: 2	Current T value: 10
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CALIBRATION:

Balance zero
Balance internal calibration is performed daily.

CONTROLS:

Calibration	2 S class weights, e.g. QCA (results in grams)
Drift	Balance is reset to zero after every 10 weighings by the microcomputer.
Recovery	2 standards, e.g. R1
Method Blank	100 mL distilled water.

SOLIDS, DISSOLVED (E3188B)

QUALITY CONTROL DATA FROM 01/01/97 TO 31/12/97

CALIBRATION CONTROL:

	n	Expected Mass (g)	Mean Mass Measured (g)	Mean Bias (g)	Standard Deviation (1)
A:	101	50.00	50.0006	0.0006	0.000079
B:	101	30.00	30.0002	0.0002	0.000054
A+B:	101	80.00	80.0009	0.0009	0.000120
A-B:	101	20.00	20.0003	0.0003	0.000059

s.d.(AB) S(between runs): 0.000067 Sw(within run): 0.000042 S/Sw: 1.6

The calibration is accepted if the calibration control values (mean mass measured) obtained lie within the ranges expressed in grams:

80.0005 - 80.0013 for A+B
20.0000 - 20.0006 for A-B

RECOVERIES:

Number of Data	Expected Concentration (mg/L)	Mean Concentration Measured (mg/L)	Standard Deviation (1)
100	2000.0	1991.1	11.0
101	500.0	496.9	6.9

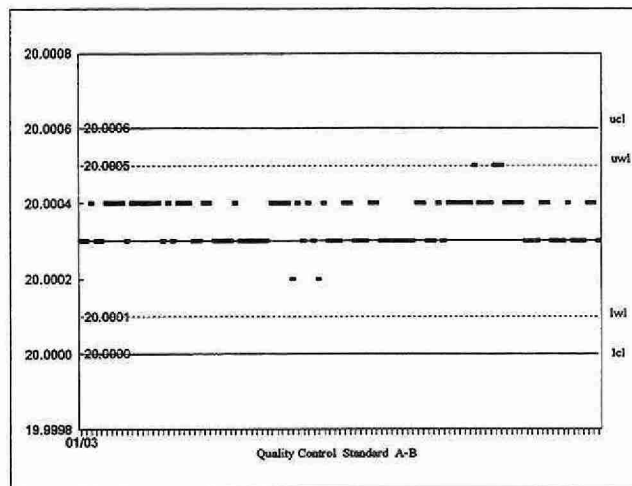
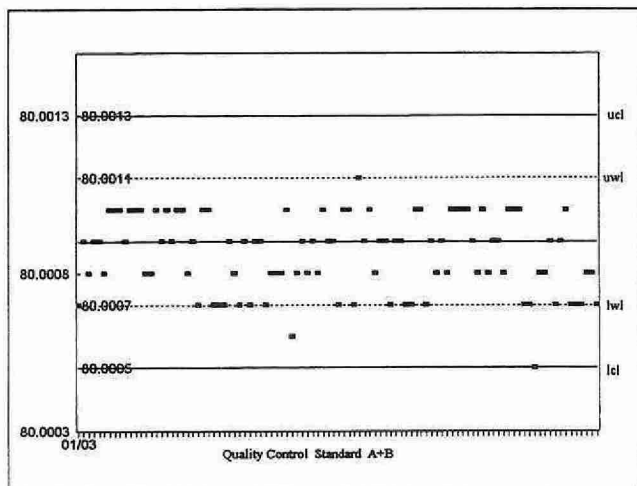
DUPLICATES:

n Data Pairs	Sample Concentration Span (mg/L)	Standard Deviation (2)	Coefficient of variation(%)
58	0 - 500	5.9705	1.9
139	501 - 1000	7.7204	1.1
48	1001 - 5000	18.513	1.0
245	Overall	10.460	

OTHER CHECKS:

	n	Data Mean (mg/L)	Standard Deviation (1)
Blank	100	-1.3911	5.8185

Solids, Dissolved (mg/L)
Quality Control Data From 01/01/97 To 31/12/97
E3188B



SOLIDS, SUSPENDED

IDENTIFICATION:

Laboratory	Water Chemistry	Method Introduced	Before '81
Method Reference No.	E3188B	Reporting Unit	mg/L
LIMS Product Code	TSD3188,SS3188,SIGN3188	Supervisor	J. McBride
Sample Type/Matrix	Sludge, Effluent, Raw Sewage, Industrial Waste, Process Water, Surface Water, Drinking Water, Ground Water, Leachate		

SAMPLING:

Quantity Required	5-500 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

An appropriately shaken sample volume (5 to 500 mL) is pipetted or quickly poured into a graduated cylinder, and the volume is measured. The aliquot is then filtered under moderate suction through a preweighed Whatman 934AH glass fibre filter. The graduated cylinder and then the filter are washed with a total of 50 mL distilled water. The filter is dried at 103-105°C, and suspended solids content is calculated by subtracting the original filter mass from the dried filter mass. Data collection, calculations, and transfer of results to LIMS are controlled by a microcomputer system.

INSTRUMENTATION:

Balance (5-decimal places), drying oven, suction filtration apparatus.
Microcomputer system with appropriate software.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.5	Current T value: 2.5
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CONTROLS:

Calibration	2 S class weights, e.g. QCA (results in grams)
Drift	Balance is reset to zero after every 10 weighings by the microcomputer.
Recovery	2 standards, e.g. R1
Method Blank	Filter washed with 500 mL distilled water

NOTES:

A standard correction factor (-0.00022g) was applied to all filters to account for weight loss during filtering.

SOLIDS, SUSPENDED (E3188B)

QUALITY CONTROL DATA FROM 01/01/97 TO 31/12/97

CALIBRATION CONTROL: (QC data from SS3188 and SIGN3188)

	n	Expected Mass (g)	Mean Mass Measured (g)	Mean Bias (g)	Standard Deviation (1)
C:	304	0.50	0.49988	-0.00012	8.925E-06
D:	304	0.05	0.05004	0.00004	0.00029
C+D:	304	0.55	0.54992	-0.00008	0.00029
C-D:	304	0.45	0.44985	-0.00015	0.00029

s.d.(AB)

S(between runs): 4.1E-08

Sw(within run): 4.1E-08

S/Sw: 1.0

The calibration is accepted if the calibration control values obtained lie within the ranges expressed in grams:

0.54984 - 0.55000 for A+B

0.44979 - 0.44991 for A-B

RECOVERIES:

Number of Data	Expected Concentration (mg/L)	Mean Concentration Measured (mg/L)	Standard Deviation (1)
300	200.0	192.9	2.1283
298	50.0	48.9	1.0512

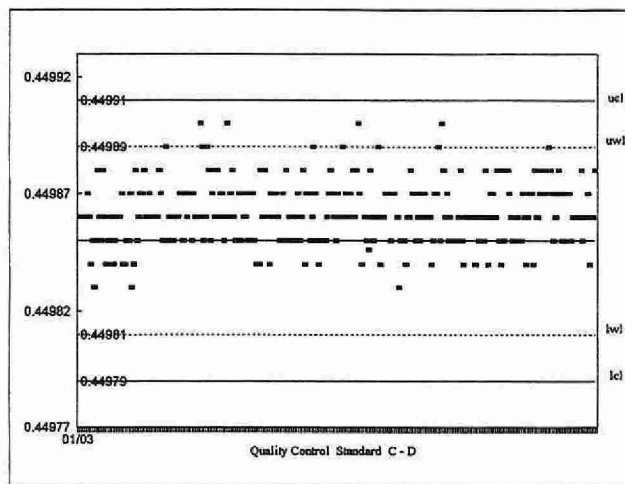
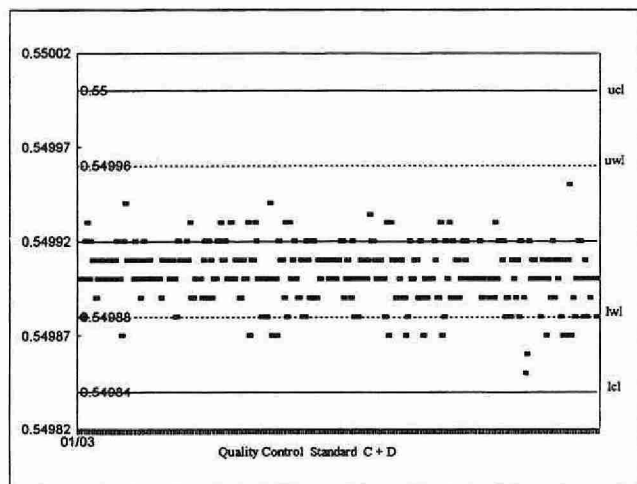
DUPLICATES:

n Data Pairs	Sample Concentration Span (mg/L)	Standard Deviation (2)	Coefficient of variation(%)
298	0 - 10	0.4872	10.3
137	10.1 - 25	1.2627	8.1
219	25.1 - 100	2.7693	5.2
100	100.1 - 500	13.6124	6.2
9	500.1 - 1000	30.8905	4.3
20	1000.1 - 10000	249.377	4.1
783	Overall	40.3191	

OTHER CHECKS:

	n	Data Mean (mg/L)	Standard Deviation (1)
Blank	301	0.2043	0.1696

Solids, Suspended (mg/L)
Quality Control Data From 01/01/97 To 31/12/97
E3188B



SOLIDS, SUSPENDED IGNITED
(Particulate Ash and Particulate Loss On Ignition)

IDENTIFICATION:

Laboratory	Water Chemistry	Method Introduced	Before '61
Method Reference No.	E3188B	Reporting Unit	mg/L
LIMS Product Code	SIGN3188	Supervisor	J. McBride
Sample Type/Matrix	Sludge, Effluent, Raw Sewage, Industrial Waste, Process Water		

SAMPLING:

Quantity Required	5-500 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

The procedure for particulate solids (SS3188) is followed and the dried residue is ignited at $600 \pm 50^{\circ}\text{C}$ for one hour in a muffle furnace. The dish is transferred to a desiccator to cool. The particulate ash (fixed solids) is the difference between the final ignited mass plus filter and the original tare weight of the filter, divided by the original sample volume (mL) used for SS3188. The particulate loss on ignition (estimate of volatile suspended solids) is the difference between the final ignited mass plus filter and the residue (suspended solids) plus filter, divided by the original sample volume (mL). Data collection, calculations, and transfer of results to LIMS are controlled by a microcomputer system.

INSTRUMENTATION:

Balance (5 decimal places), muffle furnace, filters, Petri dishes
 Microcomputer system with appropriate software

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.5	Current T value: 2.5
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CONTROLS:

Calibration	2 S class weights, e.g. QCA (results in grams)
Drift	Balance is reset to zero after every 10 weighings by the microcomputer.

SOLIDS, SUSPENDED IGNITED
(Particulate Ash and Particulate Loss On Ignition)

QUALITY CONTROL DATA FROM 01/01/97 TO 31/12/97

CALIBRATION CONTROL:

	n	Expected Mass (g)	Mean Mass Measured (g)	Mean Bias (g)	Standard Deviation (1)
C:	304	0.50	0.49988	-0.00012	8.925E-06
D:	304	0.05	0.05004	0.00004	0.00029
C+D:	304	0.55	0.54992	-0.00008	0.00029
C-D:	304	0.45	0.44985	0.00015	0.00029

s.d.(AB) S(between runs): 4.1E-08 Sw(within run): 4.1E-08 S/Sw: 1.0

The calibration is accepted if the calibration control values obtained lie within the ranges expressed in grams:

0.54984 - 0.55000 for A+B
0.44979 - 0.44991 for A-B

SOLIDS, SUSPENDED IGNITED (PARTICULATE ASH)

DUPLICATES:

n Data Pairs	Sample Concentration Span (mg/L)	Standard Deviation (2)	Coefficient of variation(%)
5	0 - 10.0	0.1391	3.7
1	10.1 - 50.0	N.A.	N.A.
6	OVERALL	0.1302	

OTHER CHECKS:

	n	Data Mean (mg/L)	Standard Deviation (1)
Blank	301	0.2043	0.1696

SOLIDS, SUSPENDED IGNITED cont'd
(Particulate Ash and Particulate Loss On Ignition)

SOLIDS, SUSPENDED IGNITED (PARTICULATE LOSS ON IGNITION)

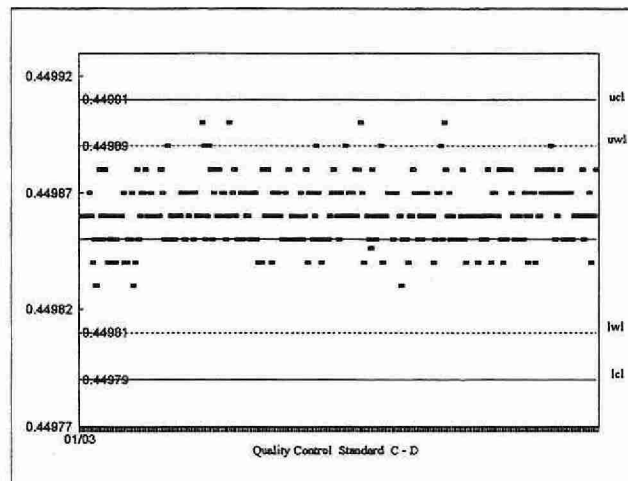
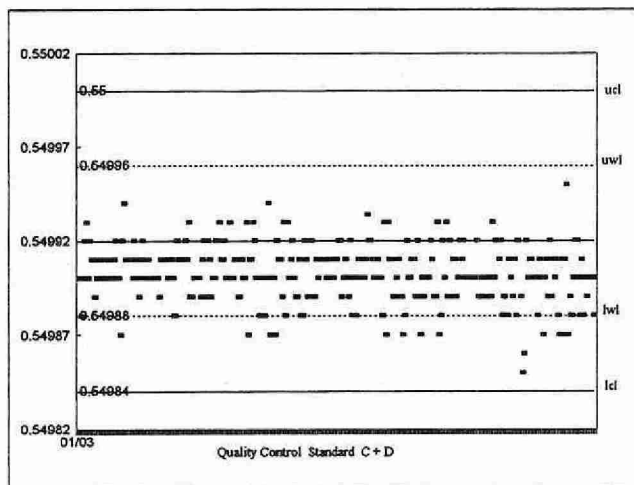
DUPLICATES:

n Data Pairs	Sample Concentration Span (mg/L)	Standard Deviation (2)	Coefficient of variation(%)
27	0 - 10.0	0.3543	8.1
65	10.1 - 50.0	1.2410	5.3
35	50.1 - 500.0	3.6272	6.3
4	500.1 - 1000.0	2.8693	0.3
98	1000.1 - 15000.0	31.8243	1.8
229	OVERALL	9.5707	

OTHER CHECKS:

	n	Data Mean (mg/L)	Standard Deviation (1)
Blank	96	0.3623	0.1809

Solids, Suspended Ignited
(Particulate Ash and Particulate Loss On Ignition)
Quality Control Data From 01/01/97 To 31/12/97
E3188B



SOLIDS, TOTAL**IDENTIFICATION:**

Laboratory	Water Chemistry	Method Introduced	Before '81
Method Reference No.	E3188B	Reporting Unit	mg/L or mg/Kg
LIMS Product Code	TSD3188,TS3188,TIGN3188	Supervisor	J. McBride
Sample Type/Matrix	Sludge, Effluent, Raw Sewage, Industrial Waste, Process Water, Surface Water, Drinking Water, Ground Water, Leachate		

SAMPLING:

Quantity Required	125 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

Generally, 100 mL aliquot of sample (alternate 50 mL) is pipetted into a preweighed Teflon dish, dried at 103-105°C, and stored in a desiccator for at least 24 hours. The total residue or solids content is calculated by subtracting the original dish mass from the dried dish mass. Data collection, calculations, and transfer of results to LIMS are controlled by a microcomputer system.

INSTRUMENTATION:

Balance (5 decimal places), drying oven, dishes (Teflon).
Microcomputer system with appropriate software.

REPORTING:

Maximum Significant Figures: 3	Current W value: 2.0	Current T value: 10
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CALIBRATION:

Balance zero
Balance internal calibration performed daily.

CONTROLS:

Calibration	2 S class weights, e.g. QCA (results in grams)
Drift	Balance is reset to zero after every 10 weighings by the microcomputer.
Recovery	2 standards, e.g. R1

SOLIDS, TOTAL (E3188B)

QUALITY CONTROL DATA FROM 01/01/97 TO 31/12/97

CALIBRATION CONTROL: (QC data from TS3188 + TIGN3188)

	n	Expected Mass (g)	Mean Mass Measured (g)	Mean Bias (g)	Standard Deviation (1)
A:	101	50.00	50.0006	0.0006	0.000079
B:	101	30.00	30.0002	0.0002	0.000054
A+B:	101	80.00	80.0009	0.0009	0.000120
A-B:	101	20.00	20.0003	0.0003	0.000059

s.d.(AB) S(between runs): 0.000067 Sw(within run): 0.000042 S/Sw: 1.6

The calibration is accepted if the calibration control values (mean mass measured) obtained lie within the ranges expressed in grams:

80.0005 - 80.0013 for A+B
20.0000 - 20.0006 for A-B

RECOVERIES: (using 100 mL aliquot)

Number of Data	Expected Concentration (mg/L)	Mean Concentration Measured (mg/L)	Standard Deviation (1)
	20000.0	20028	68.3
	2000.0	1994.7	7.1

RECOVERIES: (using 50 mL aliquot)

Number of Data	Expected Concentration (mg/L)	Mean Concentration Measured (mg/L)	Standard Deviation (1)
16	20000.0	19883.4	124.8
16	2000.0	1996.5	6.1

SOLIDS, TOTAL cont'd (E3188B)

DUPLICATES:

(using 100 mL aliquot)

n Data Pairs	Sample Concentration Span (mg/L)	Standard Deviation (2)	Coefficient of variation(%)
72	0 - 1000	6.2665	1.0
25	1001 - 5000	14.228	0.9
15	5001 - 25000	523.2	4.0
12	25001 - 50000	1237.7	3.6
7	50001 - 200000	5125.8	5.7
131	Overall	1154.3	

DUPLICATES:

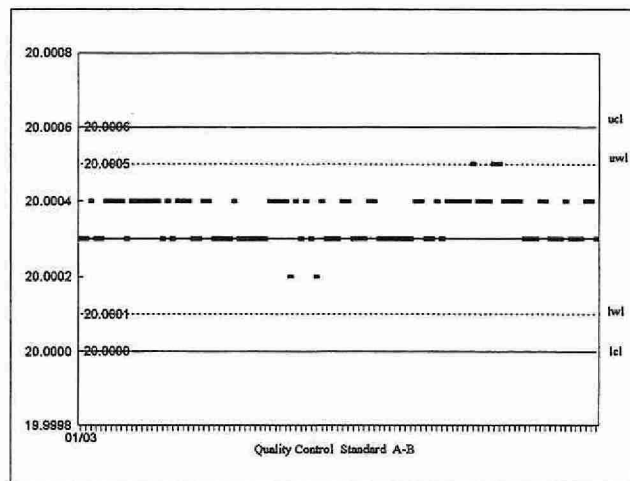
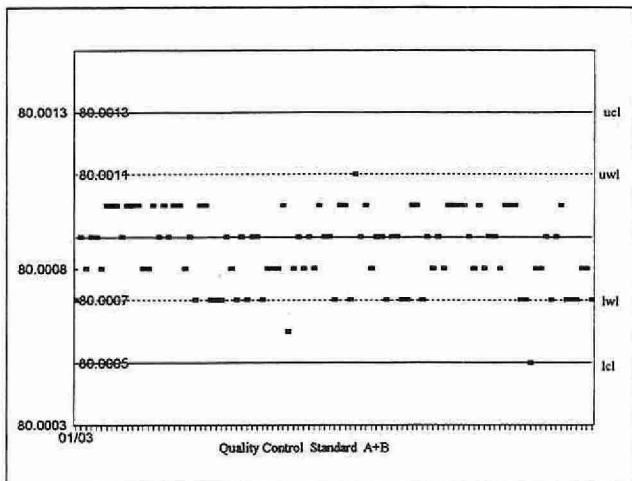
(using 50 mL aliquot)

n Data Pairs	Sample Concentration Span (mg/L)	Standard Deviation (2)	Coefficient of variation(%)
0	0 - 1000	N.A.	N.A.
6	1001 - 5000	26.43	0.8
12	5001 - 25000	115.0	0.6
5	25001 - 85000	211.4	0.8
23	Overall	125.6	

OTHER CHECKS:

	n	Data Mean (mg/L)	Standard Deviation (1)
Blank (using 100 mL aliquot)	47	0.2755	4.5658
Blank (using 50 mL aliquot)	16	3.0575	2.3500

Solids, Total (mg/L)
Quality Control Data From 01/01/97 To 31/12/97
E3188B



SOLIDS, TOTAL IGNITED
(Ash and Loss On Ignition)

IDENTIFICATION:

Laboratory	Water Chemistry	Method Introduced	Before '61
Method Reference No.	E3188B	Reporting Unit	mg/L
LIMS Product Code	TIGN3188	Supervisor	J. McBride
Sample Type/Matrix	Sludge, Effluent, Raw Sewage, Industrial Waste, Process Water		

SAMPLING:

Quantity Required	5-500 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

The procedure for total solids (TS3188) is followed and the dried residue is ignited at $600 \pm 50^{\circ}\text{C}$ for one hour in a muffle furnace. The dish is transferred to a desiccator to cool. The ash (fixed solids) is the difference between the final ignited mass plus filter and the original tare weight of the filter, divided by the original sample volume (mL) used for TS3188. The loss on ignition (estimate of volatile total solids) is the difference between the final ignited mass plus filter and the residue (total solids) plus filter, divided by the original sample volume (mL). Data collection, calculations, and transfer of results to LIMS are controlled by a microcomputer system.

INSTRUMENTATION:

Balance (5 decimal places), muffle furnace, filters, Petri dishes.
Microcomputer system with appropriate software.

REPORTING:

Maximum Significant Figures: 3	Current W value: 2.0	Current T value: 10
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CONTROLS:

Calibration	2 S class weights, e.g. QCA (results in grams)
Drift	Balance is reset to zero after every 10 weighings by the microcomputer.

SOLIDS, TOTAL IGNITED (E3188B)
(Ash and Loss On Ignition)

QUALITY CONTROL DATA FROM 01/01/97 TO 31/12/97

CALIBRATION CONTROL:

	n	Expected Mass (g)	Mean Mass Measured (g)	Mean Bias (g)	Standard Deviation (1)
A:	101	50.00	50.0006	0.0006	0.000079
B:	101	30.00	30.0002	0.0002	0.000054
A+B:	101	80.00	80.0009	0.0009	0.000120
A-B:	101	20.00	20.0003	0.0003	0.000059

s.d.(AB) S(between runs): 0.000067 Sw(within run): 0.000042 S/Sw: 1.6

The calibration is accepted if the calibration control values obtained lie within the ranges expressed in grams:

80.0005 - 80.0013 for A+B
20.0000 - 20.0006 for A-B

SOLIDS, TOTAL IGNITED (ASH)

DUPLICATES:

n Data Pairs	Sample Concentration Span (mg/L)	Standard Deviation (2)	Coefficient of variation(%)
13	0 - 2000	16.4	1.4
10	2001 - 5000	18.2	0.6
11	5001 - 15000	51.4	0.7
34	Overall	32.5	

OTHER CHECKS:

Ashed	n	Data Mean (mg/L)	Standard Deviation (1)
Blank	15	-1.014	6.0433

SOLIDS, TOTAL IGNITED cont'd
(Ash and Loss On Ignition)

SOLIDS, TOTAL IGNITED (LOSS ON IGNITION)

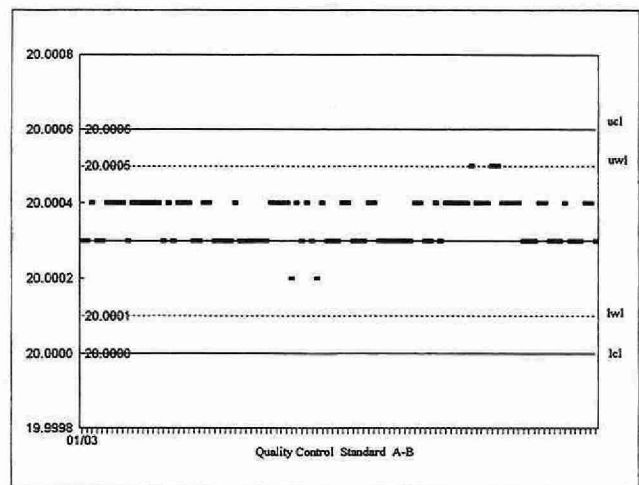
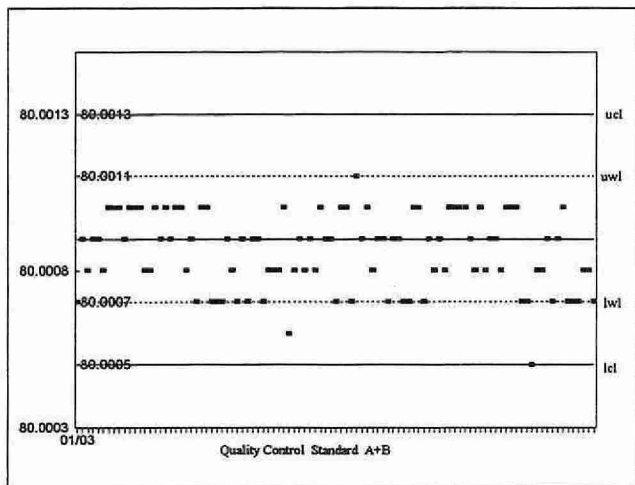
DUPLICATES:

n Data Pairs	Sample Concentration Span (mg/L)	Standard Deviation (2)	Coefficient of variation(%)
4	0 - 2000	12.5	1.0
4	2001 - 5000	369.2	9.7
5	5001 - 10000	72.8	1.1
7	10001 - 25000	136.6	0.8
2	25001 - 50000	N.A.	N.A.
22	OVERALL	189.5	

OTHER CHECKS:

LOI	n	Data Mean (mg/L)	Standard Deviation (1)
Blank	15	4.1733	6.1711

Solids, Total Ignited(mg/L)
(Particulate Ash and Loss on Ignition)
Quality Control Data From 01/01/97 To 31/12/97
E3188B



SULPHATE

IDENTIFICATION:

Laboratory Unit	Water Chemistry	Method Introduced	01/04/78
Method Reference No.	E3004A	Units	$\mu\text{g}/\text{m}^3$ as SO_4
LIMS Product Code	ANION3004	Supervisor	J. McBride
Sample Type/Matrix	Air; HiVol Glass Fibre, Quartz and Polyflon, Other Filters and Puff		

SAMPLING:

Quantity Required	3/4" or 1.9cm strip from 8"x10" filter
Container	50 mL polypropylene tube

SAMPLING PREPARATION:

A 3/4" strip is cut in pieces and deposited into a 50 mL polypropylene tube. 50 mL of Pure-Water is added to the tube. The tube is placed on a horizontal shaker for approximately 1 hour. The supernatant is then filtered into a 15 mL plastic tube and analysed.

ANALYTICAL PROCEDURE:

Sulphate separated from other anions in the sample by automated suppressed ion chromatography using an eluent mixture of sodium bicarbonate and sodium carbonate and a conductivity detector. The concentration of sulphate (mg/L) is determined by the comparison of the analyte peak area count to that of a series of standards. The analyte result is corrected for the filter blank before the final calculation is made. The result is reported as $\mu\text{g}/\text{m}^3$ as SO_4 . Chloride and nitrate are determined simultaneously.

INSTRUMENTATION:

Horizontal Shaker, ion chromatographic system plus a PC with ChromPerfect software and DT2804 card for automated sample injection, timing, and data processing.

REPORTING:

Maximum Significant Figures: 2	Current W value: $0.1 \mu\text{g}/\text{m}^3$	Current T value: $0.5 \mu\text{g}/\text{m}^3$
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CALIBRATION:

6 standards

CONTROLS:

Calibration	MB, IS(n), CS1, and CS2
Drift	Duplicate plus 2 standard approximately every 20 samples

SULPHATE cont'd

NOTES:

Duplicate criterion is based on duplicate analysis of the same filter because duplicate filters are not received. To convert unit from mg/L to $\mu\text{g}/\text{m}^3$, the final concentration of SO_4 in mg/L is multiplied by the following formula:

$$\text{Result}(\text{mg/L}) \times 50\text{mL} \times (63/6.75) / \text{air volume} = \mu\text{g}/\text{m}^3$$

Where: 63 is the area of the filter exposed and 6.75 is the sample aliquot are (in^2)

SULFATE (E3004A)

QUALITY CONTROL DATA FROM 01/01/97 TO 24/12/97

Analytical Range: to 50 mg/L

DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
41	0.00 - 10.0	0.1077	1.2
33	10.1 - 25.0	0.2611	2.1
24	25.1 - 50.0	1.0526	2.7
98	Overall	0.3162	

SULPHATE

IDENTIFICATION:

Laboratory	Dorset	Method Introduced	01/04/78
Method Reference No.	E3147A	Reporting Unit	mg/L as SO ₄
LIMS Product Code	ANION3147	Supervisor	F. Tomassini
Sample Type/Matrix	Precipitation, Leachate, Surface Water		

SAMPLING:

Quantity Required	15 mL
Container	Glass or Plastic

ANALYTICAL PROCEDURE:

Sulphate is separated from other anions in the sample by automated suppressed ion chromatography using an eluent mixture of 0.003 M sodium bicarbonate and 0.0024 M sodium carbonate with conductivity detection. Samples are spiked with Na₂CO₃/NaHCO₃ to match the eluent strength and maintain background conductivity. The concentration of sulphate in mg/L as SO₄ is determined by the comparison of the sample peak heights to a series of standards.

Chloride is determined simultaneously.

INSTRUMENTATION:

Modular continuous flow ion chromatographic system plus microcomputer for automated sample injection, timing, and partial data processing.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.05	Current T value: 0.25
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CALIBRATION:

BL plus 7 standards

CONTROLS:

Calibration	LTBL plus 2 standards, e.g., QCA
Drift	1 standard every 10 samples.

SULPHATE (E3147A)

QUALITY CONTROL DATA FROM 09/01/97 TO 22/12/97

Full Scale: to 10.0 mg/L as SO₄

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	32	8.0	8.002	0.002	0.0652
B:	32	2.0	1.992	-0.008	0.0415
A+B:	32	10.0	9.967	-0.033	0.0943
A-B:	32	6.0	6.009	0.011	0.0699

s.d.(AB) S(between runs): 0.059

Sw(within run): 0.049

S/Sw: 1.2

The calibration is accepted if the calibration control values obtained lie within the ranges:

9.70 - 10.30 for A+B
5.72 - 6.23 for A-B

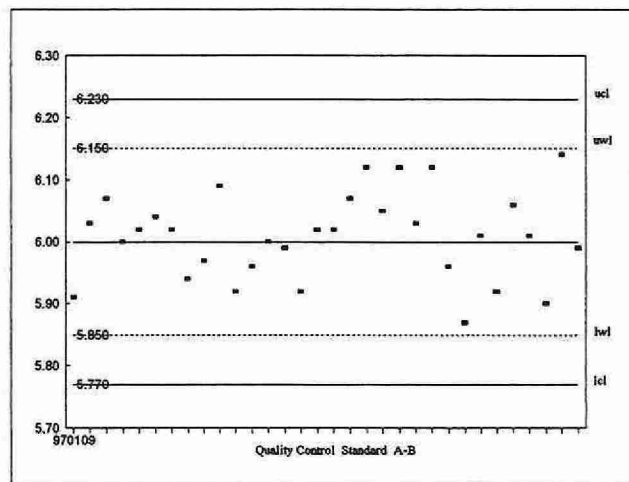
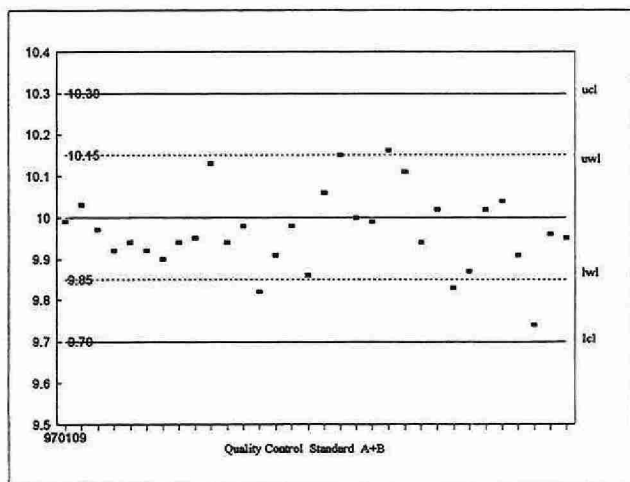
DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
11	0.00 - 1.00	0.0204	3.0
18	1.01 - 2.00	0.0417	2.6
36	2.01 - 5.00	0.0511	1.4
51	5.01 - 10.0	0.0784	5.0
116	Overall	0.0593	

OTHER CHECKS:

	n	Mean	Standard Deviation (1)
Long Term Blank	32	0.014	0.0207

Sulphate (mg/L as SO₄)
Quality Control Data From 09/01/97 To 22/12/97
E3147A



SULPHATE

IDENTIFICATION:

Laboratory Unit	Water Chemistry	Method Introduced	01/04/78
Method Reference No	E3148A	Reporting Unit	$\mu\text{g}/\text{Filter as SO}_4$
LIMS Product Code	LOV3148, ANLOV3148, TEF3148, NYL3148, SDIO3148, ANION3148	Supervisor	J. McBride
Sample Type/Matrix	Air; Sequential and LoVol filters		

SAMPLING:

Quantity Required	1 filter for W40, Teflon or Nylon. 1 set of 2 W41 filters
Container	50 mL polypropylene tube
Other	For W41 filters, filters are impregnated with potassium carbonate / glycerol solution

SAMPLE PREPARATION:

Filters are extracted with 50.0 mL of DDW (W40) or 25.0 mL of DDW (Teflon) or 25.0 mL of 0.03 N NaOH (Nylon) in polypropylene tubes with ultrasonic treatment followed by a 24 hour rest period. For W41 filters, filters are extracted with 50.0 mL of 0.05% H_2O_2 in polypropylene tubes with one hour of mechanical shaking, followed by ultrasonic treatment to enhance extraction, then a 24 hour rest period. SO_2 is converted to SO_4 in the process.

ANALYTICAL PROCEDURE:

Sulphate is separated from other anions in the sample by automated suppressed ion chromatography using an eluent mixture of 0.003 M sodium bicarbonate and 0.0024 M sodium carbonate with conductivity detection. Samples are spiked with $\text{Na}_2\text{CO}_3/\text{NaHCO}_3$ to match the eluent strength and maintain background conductivity. The concentration of sulphate in mg/L as SO_4 is determined by the comparison of the sample peak heights to a series of standards. Results are converted to $\mu\text{g}/\text{filter as SO}_4$ for W40, Teflon and Nylon filters. As for W41 filters, results are converted to $\mu\text{g}/\text{filter as SO}_2$. Chloride and nitrogen-nitrate are determined simultaneously.

INSTRUMENTATION:

Mechanical shaker, Ultrasonic bath; modular continuous flow ion chromatographic system plus microcomputer for automated sample injection, timing and partial data processing.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.02 mg/L	Current T value: 0.1 mg/L
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CALIBRATION:

BL plus 9 standards

SULPHATE cont'd

CONTROLS:

Calibration	LTBL plus 2 standards, e.g. QCA
Drift	1 standard every 10 samples

NOTES:

Detection criterion is based on duplicate analyses of the extract from one filter because duplicate filters are not received. To convert unit from mg/L to $\mu\text{g}/\text{Filter}$, multiply the concentration of SO_4 in mg/L by 50 for W40 filters or 25 for Teflon or Nylon filters or 33.3 for W41 filters.

SULPHATE (E3148A)

QUALITY CONTROL DATA FROM 16/01/97 TO 09/12/97

Full Scale: to 10.0 mg/L as SO₄

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	22	8.0	7.955	-0.045	0.080
B:	22	2.0	1.959	-0.041	0.055
A+B:	22	10.0	9.914	-0.086	0.110
A-B:	22	6.0	5.996	-0.004	0.084

s.d.(AB)

S(between runs): 0.069

Sw(within run):0.059

S/Sw: 1.2

The calibration is accepted if the calibration control values obtained lie within the ranges:

9.68 - 10.32 for A+B
5.76 - 6.24 for A-B

DUPLICATES:

For W40 filters:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
5	0 - 2.00	0.0196	1.4
13	2.01 - 5.00	0.0528	1.8
5	5.01 - 10.00	0.0249	0.4
23	Overall	0.0370	

For Teflon filters:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
11	0 - 1.00	0.0223	2.6
7	1.01 - 2.00	0.0413	2.8
5	2.01 - 5.00	0.0427	1.3
3	5.01 - 10.00	0.0672	1.0
26	Overall	0.0343	

SULPHATE cont'd (E3148A)

QUALITY CONTROL DATA FROM 16/01/97 TO 09/12/97

Full Scale: to 10.0 mg/L as SO₄

For Nylon filters:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
25	0 - 1.00	0.0106	2.3
8	1.01 - 2.00	0.0350	2.8
6	2.01 - 5.00	0.0795	2.8
1	5.01 - 10.00	0.2297	4.2
40	Overall	0.0239	

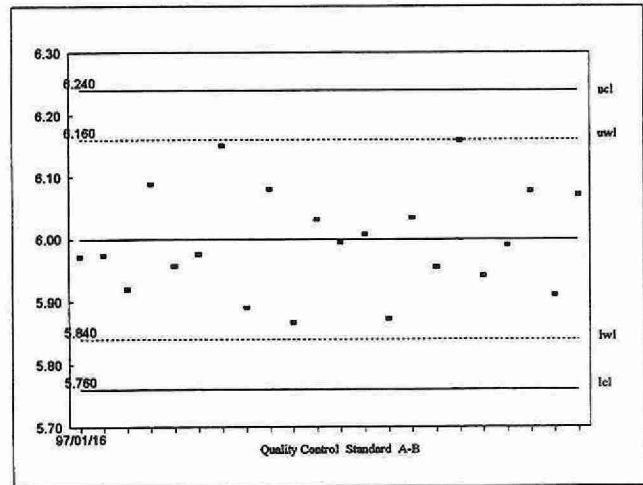
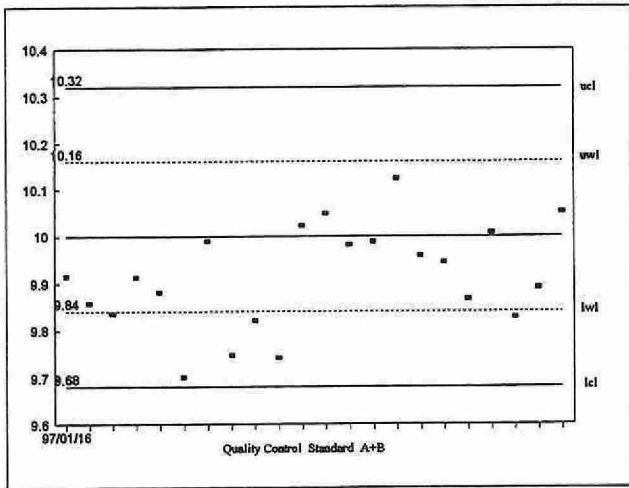
For W41 filters:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
21	0 - 1.00	0.0158	2.2
4	1.01 - 2.00	0.0358	3.5
11	2.01 - 5.00	0.0435	1.2
2	5.01 - 10.00	0.0493	0.7
38	Overall	0.0274	

OTHER CHECKS:

	n	Mean	Standard Deviation (1)
Long Term Blank	22	0	0

Sulphate (mg/L as SO₄)
Quality Control Data From 16/01/97 To 09/12/97
E3148A



SULPHATE

IDENTIFICATION:

Laboratory	Water Chemistry	Method Introduced	01/04/82
Method Reference No.	E3172A	Reporting Unit	mg/L as SO ₄
LIMS Product Code	SULP3172	Supervisor	J. McBride
Sample Type/Matrix	Drinking Water, Surface Water, Ground Water, Leachates, Effluent, Industrial Waste, Raw Sewage		

SAMPLING:

Quantity Required	50 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

Sulphate is separated from other anions in the samples by automated suppressed ion chromatography using an eluent mixture of 0.003 M sodium bicarbonate and 0.0024 M sodium carbonate with conductivity detection. The concentration of sulphate in mg/L as SO₄ is determined by comparison of the sample scan to a series of standard scans.

INSTRUMENTATION:

Basic modular continuous flow ion chromatographic system plus control module (in-house design) for automated sample introduction and timing.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.5	Current T value: 2.5
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CALIBRATION:

BL plus 10 standards

CONTROLS:

Calibration	LTBL plus 2 standards, e.g. QCA
Drift	1 standard every 10 samples

SULPHATE (E3172A)

QUALITY CONTROL DATA FROM 07/01/97 TO 18/12/97

Full Scale: to 100.0 mg/L as SO₄

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	37	80.0	81.3	1.3	0.7058
B:	37	20.0	20.1	0.1	0.3272
A+B:	37	100.0	101.4	1.4	0.8681
A-B:	37	60.0	61.2	1.2	0.6760

s.d.(AB) S(between runs): 0.55

Sw(within run): 0.49

S/Sw: 1.13

The calibration is accepted if the calibration control values obtained lie within the ranges:

97.2 - 102.8 for A+B
57.9 - 62.1 for A-B

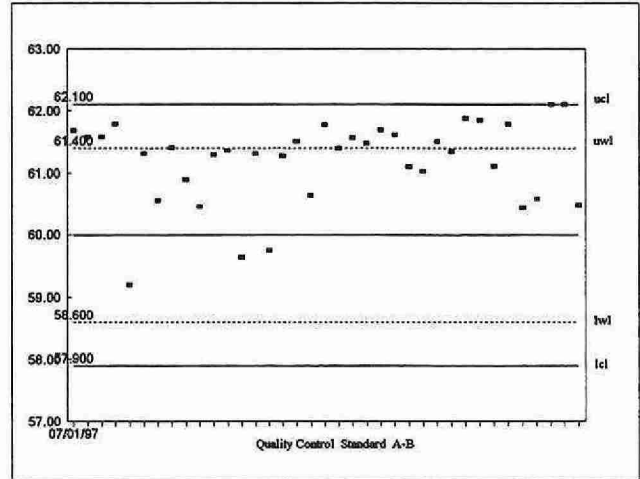
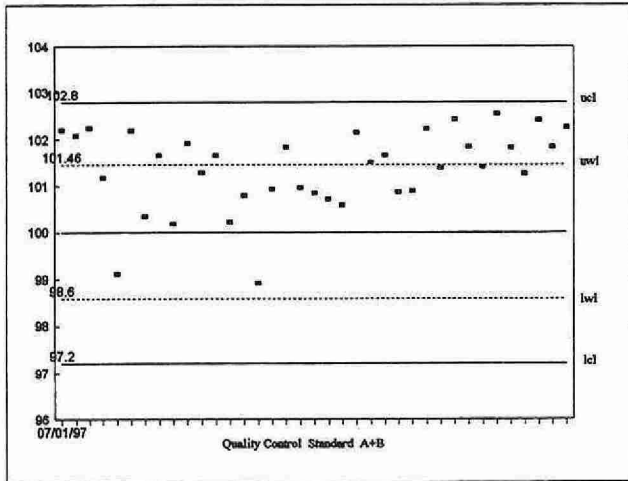
DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
22	0.0 - 10.0	0.2460	4.0
20	10.1 - 20.0	0.3245	2.1
50	20.1 - 50.0	0.6048	2.5
10	50.1 - 100.0	0.9816	1.1
102	Overall	0.5545	

OTHER CHECKS:

	n	Mean	Standard Deviation (1)
Long Term Blank	37	0.5184	0.0837

Sulphate (mg/L as SO₄)
Quality Control Data From 07/01/97 To 18/12/97
E3172A



SULPHATE

IDENTIFICATION:

Laboratory	Water Chemistry	Method Introduced	01/04/78
Method Reference No	E3372A	Reporting Unit	mg/L as SO ₄
LIMS Product Code	ANION3372	Supervisor	J. McBride
Sample Type/Matrix	Precipitation		

SAMPLING:

Quantity Required	15 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

Sulphate is separated from other anions in the sample by automated suppressed ion chromatography using an eluent mixture of 0.003 M sodium bicarbonate and 0.0024 M sodium carbonate with conductivity detection. Samples are spiked with Na₂CO₃/NaHCO₃ to match the eluent strength and maintain background conductivity. The concentration of sulphate in mg/L as SO₄ is determined by the comparison of the sample peak heights to a series of standards.

Chloride and nitrogen-nitrate are determined simultaneously.

INSTRUMENTATION:

Modular continuous flow ion chromatographic system plus microcomputer for automated sample injection, timing, and partial data processing.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.05	Current T value: 0.25
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CALIBRATION:

BL plus 7 standards

CONTROLS:

Calibration	LTBL plus 2 standards, e.g. QCA
Drift	1 standard every 10 samples

NOTES:

Same analytical method as E3147A operating in Dorset Lab. New method number introduced for Toronto Lab in 1993 is E3372A.

SULPHATE (E3372A)

QUALITY CONTROL DATA FROM 07/01/97 TO 23/12/97

Full Scale: to 5.0 mg/L as SO₄

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	26	4.00	3.989	-0.011	0.0296
B:	26	1.00	0.998	-0.002	0.0235
A+B:	26	5.00	4.988	-0.012	0.0373
A-B:	26	3.00	2.991	-0.009	0.0382

s.d.(AB) S(between runs): 0.0267 Sw(within run): 0.027 S/Sw: 0.99

The calibration is accepted if the calibration control values obtained lie within the ranges:

4.79 - 5.21 for A+B
2.84 - 3.16 for A-B

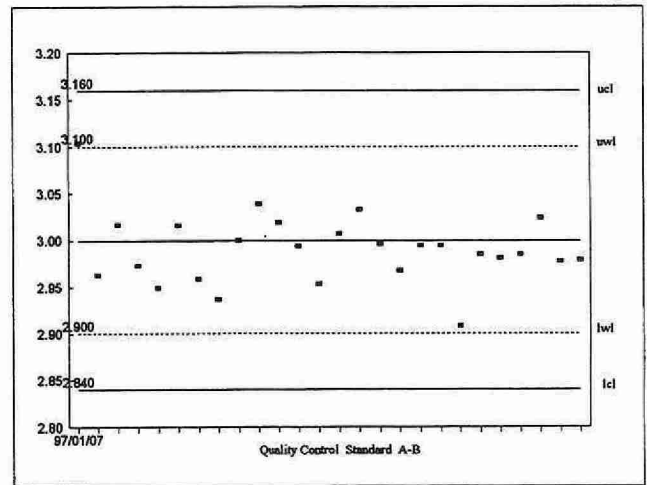
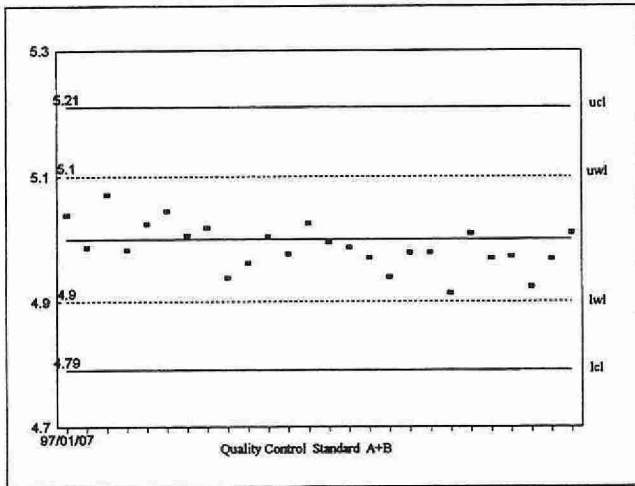
DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
9	0.00 - 1.00	0.0141	2.4
12	1.01 - 2.50	0.0299	1.4
9	2.50 - 5.00	0.0575	1.6
30	Overall	0.0329	1.7

OTHER CHECKS:

	n	Mean	Standard Deviation (1)
Long Term Blank	26	0.004	0.0071

Sulphate (mg/L as N)
Quality Control Data From 07/01/97 To 23/12/97
E3372A



TURBIDITY

IDENTIFICATION:

Laboratory	Water Chemistry	Method Introduced	Before '74
Method Reference No.	E3311A	Reporting Unit	FTU
LIMS Product Code	TURB3311	Supervisor	J. McBride
Sample Type/Matrix	Surface Water, Ground Water, Effluent, Drinking Water, Industrial Waste, Process Water, Leachate		

SAMPLING:

Quantity Required:	50 mL
Container:	Glass or plastic

ANALYTICAL PROCEDURE:

The instrument is standardized with sealed standards which are prepared commercially and rated in Formazin Turbidity Units. Samples are placed in the turbidimeter, and results in FTU are read directly from the digital output. Turbidity measurement are based on light scattering at 90 plus or minus 30 degrees of rotation. The instrument compensates for sample colour.

INSTRUMENTATION:

-Hach Ratio/XR Model Turbidimeter modified to accept control signals from robot controller, electronic interphase, Zymark ZYMATE 11 Laboratory Robot System, IBM PC computer.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.05	Current T value: 0.25
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CALIBRATION:

BL plus formazin standards (once every four months)

CONTROLS:

Calibration:	5 standards, e.g. QCA
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NOTES:

Results were not requested for the following ranges at:
20 FTU during June 18 - 27, 1997
2000 FTU during June 2 - 20 and Aug - Dec, 1997.

TURBIDITY (E3311A)

QUALITY CONTROL DATA FROM 08/01/97 TO 29/12/97

Full Scale: to 2000 FTU

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Standard Deviation (1)
A:	187	2.0	1.46	0.0248
B:	181	20.0	15.44	0.2536
C:	186	200.0	127.45	1.3050
D:	89	2000.0	1478.22	7.6689

On any given day the calibration is accepted if the values obtained lie within the ranges:

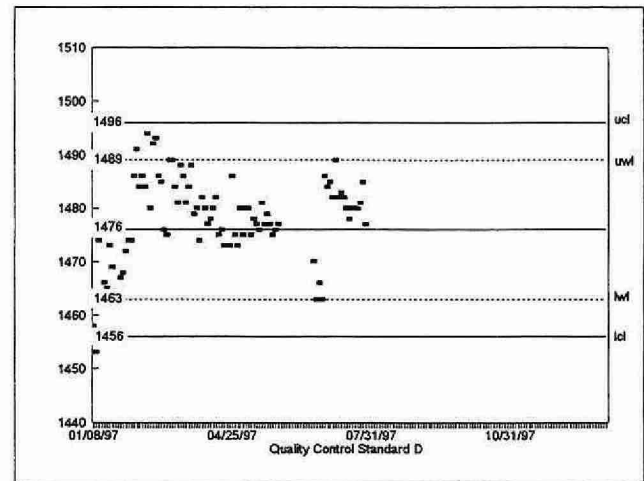
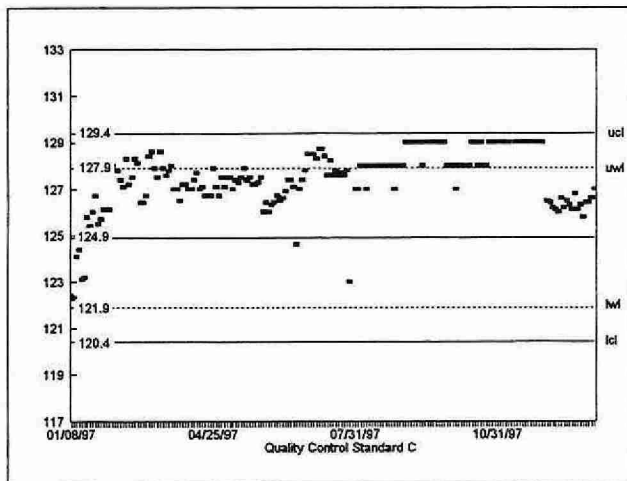
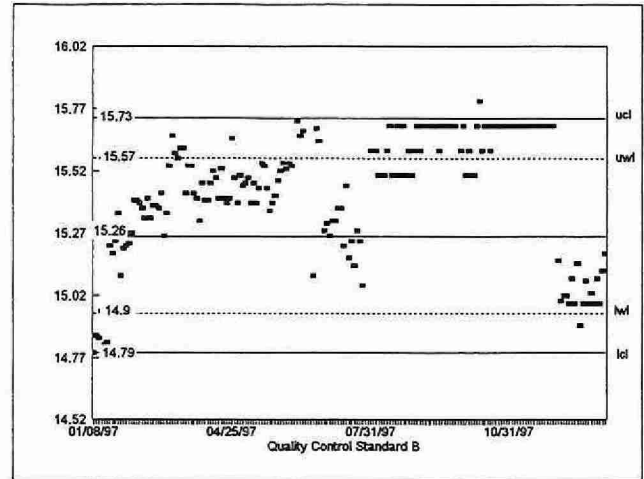
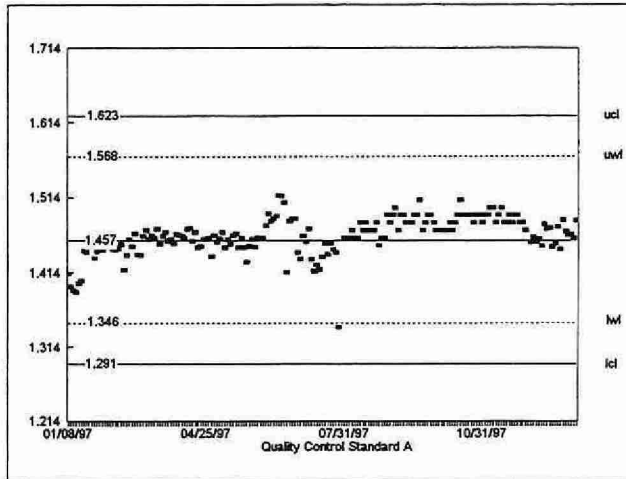
1.29	-	1.62	for	A
14.8	-	15.7	for	B
120	-	129	for	C
1456	-	1496	for	D

	n	Data Mean	Standard Deviation (1)
Stray Light	187	0.0437	0.0047

DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
279	0.0 - 2.0	0.0522	9.1
155	2.1 - 20.0	0.4252	6.1
40	21.0 - 200	3.0548	5.6
3	201 - 2000	22.282	6.1
477	Overall	1.9913	

Turbidity
Quality Control Data from 08/01/97 To 29/12/97
E3311A



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ABBREVIATIONS

AAlI	- Auto Analyzer Model II
AAS	- Atomic Absorption Spectrophotometer
Bl	- Blank
°C	- Degree Centigrade
cm	- Centimetre
CS1	- Check Sample 1
CS2	- Check Sample 2
Date	- Day/Month/Year
DDW	- Distilled Deionized Water
Pure-DW	- Pure Deionized Water
DO	- Dissolved Oxygen
DW	- Distilled Water
EDTA	- Ethylenediaminetetra-Acetic Acid, Disodium Salt, Dihydrate
FTU	- Formazin Turbidity Units
g	- Gram
HZU	- Hazen Units
in ²	- Square Inches
IS(n)	- Internal Standard (n denotes parameter)
kg	- kilogram
L	- Litre
LAB	- Laboratory
LIMS	- Laboratory Information Management System
LTB/L	- Long Term Blank
lcl	- Low Control Limit
lwl	- Low Warning Limit
m ³	- Cubic Metre
M	- Molarity
MB	- Method Blank
meq	- Milliequivalent
mg	- Milligram
min	- Minute
mL	- Millilitre
mm	- Millimetre
N	- Normality
N.A.	- Not Available or Not Applicable
nm	- Nanometre

ABBREVIATIONS cont'd

n	- Number
PC	- Personal Computer
QC	- Quality Control
QCA	- Quality Control Standard A
QCB	- Quality Control Standard B
QCC	- Quality Control Standard C
QCD	- Quality Control Standard D
R	- Recovery
rpm	- Revolutions Per Minute
RS92	- Reference Standard (in -house)
S	- Between Run Standard Deviation
S ₁	- Standard Deviation (Conventional)
S ₂	- Standard Deviation For Duplicates
S _w	- Standard Deviation Within Run
S. Class	- Weight Classification Designation (not certified)
s.d.	- Standard Deviation
Standard Cal	- Colourimeter setting to control electronic expansion
STD	- Standard
TCU	- True Colour Units
TPTZ	- Ferrous-2,4,6-tri(2'pyridyl)-1,3,5,- triazine
ucl	- Upper Control Limit
uwl	- Upper Warning Limit
μm	- Micrometer
μeq	- Microequivalent
μg	- Microgram
μS	- Micro-Siemen
UV	- Ultra-Violet
V/V	- Concentration based on volume measurements
W40	- Whatman 40 Filters
%	- Percent

Appendix A
W and T values for 1997

Parameter	Method Reference No.	Units	Full Scale	W	T
Acidity, Gran	(E3248A)	µg/L H ⁺	1000	1.0	5.0
Acidity, Total Fixed Endpoint	(E3248A)	mg/L CaCO ₃	1000	0.05	0.25
Alkalinity, Gran	(E3042A)	mg/L CaCO ₃	-	-	-
Alkalinity, Total Fixed Endpoint	(E3042A)	mg/L CaCO ₃	500	0.05	0.25
Alkalinity, Total Fixed Endpoint	(E3218A)	mg/L CaCO ₃	1000	0.5	2.5
Alkalinity, Total Fixed Endpoint	(E3289A)	mg/L CaCO ₃	1000	0.2	1.0
Aluminum, Total	(E3300A)	µg/L Al	1000	2	10
Calcium	(E3249A)	mg/L Ca	8.0	0.02	0.1
Carbon, Dissolved Inorganic	(E3028A)	mg/L C	10.0	0.02	0.1
Carbon, Dissolved Inorganic	(E3370A)	mg/L C	80.0	0.2	1.0
Carbon, Dissolved Organic	(E3370A)	mg/L C	20.0	0.1	0.5
Chloride	(E3004A)	µg/m ³ Cl	14.7	0.1	0.5
Chloride	(E3016A)	mg/L Cl	100	0.2	1.0
Chloride	(E3147A)	mg/L Cl	2.0	0.01	0.05
Chloride	(E3148A)	µg/filter Cl	2.0	0.02 mg/L	0.10 mg/L
Chloride	(E3372A)	mg/L Cl	1.0	0.01	0.05
Chlorine, Total Residual	(E3309A)	µg/L Cl ₂	50	2	10
Chlorophyll "a"	(E3169A)	µg/L	-	0.2	1.0
Chlorophyll "a" Acidified	(E3169A)	µg/L	-	1.0	5.0
Chlorophyll "b"	(E3169A)	µg/L	-	0.1	0.5
Colour, True	(E3025A)	TCU	100	0.2	1.0
Colour, True	(E3219A)	TCU	100	0.2	1.0
Conductivity	(E3024B)	µS/cm	500	0.2	1.0
Conductivity	(E3177A)	µS/cm	100	0.2	1.0
Conductivity	(E3218A)	µS/cm	2000	1	5
Conductivity	(E3289A)	µS/cm	2000	1	5
Cyanide, Total	(E3015A)	mg/L CN ⁻	0.2	0.001	0.005
Fluoride	(E3369A)	mg/L F	2.0	0.01	0.05

Appendix A
W and T values for 1997

Parameter	Method Reference No.	Units	Full Scale	W	T
Iron, Total	(E3303B)	µg/L Fe	1000	2	10
Magnesium	(E3249A)	mg/L Mg	2.0	0.005	0.025
Manganese	(E3303B)	µg/L Mn	200	1	5
Nitrate	(E3004A)	µg/m ³ NO ₃	14.7	0.1	0.5
Nitrogen,					
Ammonia Plus Ammonium	(E3364A)	mg/L N	2.0	0.002	0.01
Ammonia Plus Ammonium	(E3366A)	mg/L N	50.0	0.05	0.25
Ammonia Plus Ammonium	(E3374A)	µg/L N	1000	1	5
Nitrogen, Nitrate	(E3148A)	µg/Filter N	2.0 mg/L	0.01 mg/L	0.05 mg/L
Nitrogen, Nitrate	(E3372A)	mg/L N	1.0	0.01	0.05
Nitrogen, Nitrate Plus Nitrite	(E3364A)	mg/L N	5.00	0.005	0.025
Nitrogen, Nitrate Plus Nitrite	(E3366A)	mg/L N	50.0	0.05	0.25
Nitrogen, Nitrate Plus Nitrite	(E3369A)	mg/L N	20.0	0.1	0.5
Nitrogen, Nitrate Plus Nitrite	(E3374A)	µg/L N	1000	2	10
Nitrogen, Nitrite	(E3364A)	mg/L N	0.200	0.001	0.005
Nitrogen, Nitrite	(E3366A)	mg/L N	2.00	0.005	0.025
Nitrogen, Total Kjeldahl	(E3116A)	mg/g N	20	0.1	0.5
Nitrogen, Total Kjeldahl	(E3118A)	mg/g N	100	0.2	1
Nitrogen, Total Kjeldahl	(E3367A)	mg/L N	2.00	0.02	0.1
Nitrogen, Total Kjeldahl	(E3368A)	mg/L N	50.0	0.05	0.25
Oxygen Demand, Biochemical	(E3182A)	mg/L O	9.0	0.2	1
Oxygen Demand, Chemical	(E3170A)	mg/L O	40.0	1	5
Oxygen Demand, Chemical	(E3246A)	mg/L O	500	2	10
pH	(E3042A)	-	-	-	-
pH	(E3218A)	-	-	-	-
pH	(E3248A)	-	-	-	-
pH	(E3289A)	-	-	-	-
Phenolics, Reactive	(E3179A)	µg/L Phenol	50.0	0.2	1.0

Appendix A
W and T values for 1997

Parameter	Method Reference No.	Units	Full Scale	W	T
Phosphorus,					
Reactive ortho-Phosphate	(E3364A)	mg/L P	0.100	0.0005	0.0025
Reactive ortho-Phosphate	(E3366A)	mg/L P	10.0	0.02	0.10
Phosphorus, Total	(E3116A)	mg/g P	5	0.02	0.10
Phosphorus, Total	(E3118A)	mg/g P	8	0.02	0.10
Phosphorus, Total	(E3367A)	mg/L P	0.200	0.002	0.01
Phosphorus, Total	(E3368A)	mg/L P	10.0	0.02	0.10
Potassium	(E3249A)	mg/L K	1.0	0.005	0.025
Silicon, Reactive Silicates	(E3370A)	mg/L Si	10.0	0.02	0.10
Sodium	(E3249A)	mg/L Na	4.0	0.005	0.025
Solids, Dissolved	(E3188B)	mg/L	-	2	10
Solids, Suspended	(E3188B)	mg/L	-	0.5	2.5
Solids, Suspended Ignited	(E3188B)	mg/L	-	0.5	2.5
Solids, Total	(E3188B)	mg/L	-	2.0	10.0
Solids, Total Ignited	(E3188B)	mg/L	-	2.0	10.0
Sulphate	(E3004A)	µg/m ³ SO ₄	14.7	0.1	0.5
Sulphate	(E3147A)	mg/L SO ₄	10.0	0.05	0.25
Sulphate	(E3148A)	µg/filter SO ₄	10.0 mg/L	0.02 mg/L	0.1 mg/L
Sulphate	(E3172A)	mg/L SO ₄	100	0.5	2.5
Sulphate	(E3372A)	mg/L SO ₄	5.0	0.05	0.25
Turbidity	(E3311A)	FTU	2000	0.05	0.25



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